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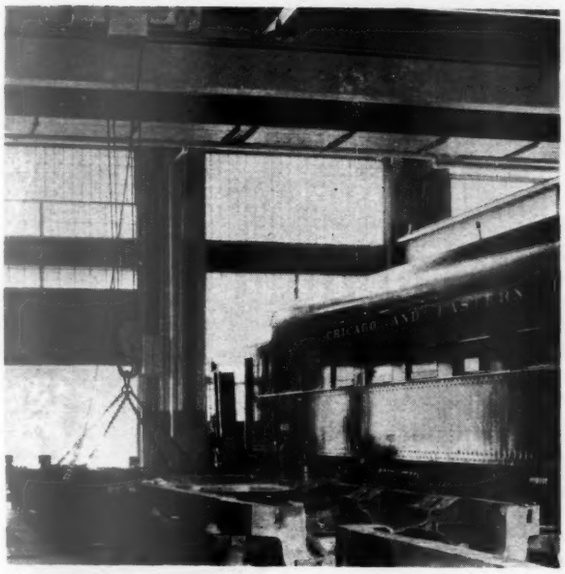

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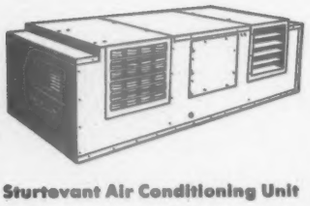

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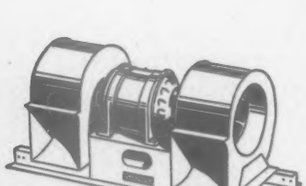

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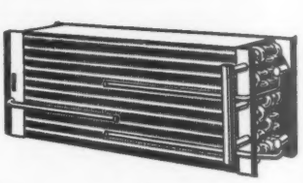

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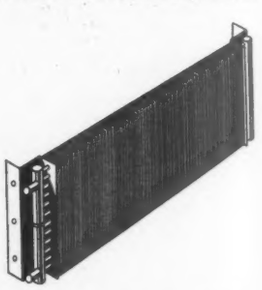

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French Tests Show

High Locomotive Efficiencies

By Lawford H. Fry*

Attention to details of design makes it possible for 120-ton four-cylinder compound locomotive to develop 3,700 i. hp. with a water rate of 13 lb. per horsepower hour

THE present article calls attention to the remarkable work which has been done by the French railways in the last ten years in developing the efficiency of the steam locomotive. A detailed account of this work forms an important part of André Chapelon's book on the Steam Locomotive.† The advances made can be summed up by the statement that the Paris-Orleans-Midi Railway started with a reasonably efficient Pacific type locomotive weighing about 220,000 lb. and giving about 2,200 i. hp. and by improving the boiler and the superheater and by the redesign of the cylinders, a 4-8-0 locomotive was evolved which developed about 3,700 i. hp. with an increase in weight of only about 20,000 lb. This is so striking that it is worth very careful consideration by American locomotive engineers.

The present article offers information as to the results obtained with the reconstructed locomotive and attempts to set forth the information in logical form. The values quoted have been obtained from an extensive array of test data reported by Mr. André Chapelon, equipment engineer of the Paris-Orleans-Midi, in a series of articles which appeared in the Revue Generale des Chemin de Fer for February and March, 1935. The greater part of the test data was obtained in road tests, the test train consisting of one or more brake locomotives running in reverse gear with the cylinders acting as air compressors. The resistance of these brake locomotives can be varied by altering the cut-off, so that the drawbar pull on the locomotive being tested can be kept constant in spite of variations in grades. In this way the effect of the profile of the road can be eliminated and the test locomotive can be run continuously at constant speed and cut-off.

Design of Test Locomotives

The locomotives tested were four-cylinder compounds with poppet valves, Serve ribbed flues, and Houlet superheaters. They were of the 4-8-0 type, rebuilt from the earlier four-cylinder compound Pacifics. It is not possible here to quote all of the voluminous test data or Mr. Chapelon's illuminating discussion of it. The original will repay careful study. Several locomotives were tested, the designs varying slightly. The dimensions given in the accompanying table are those finally adopted as most satisfactory. The tests now discussed were not always made with locomotives having all of the dimensions given, but the boiler test figures were obtained from boilers of the dimensions quoted and similarly for the cylinders. In presenting the results here, no further attempt is made to show that boiler and cylinder tests do not necessarily come from the same machine.

In its final design the locomotive is a four-cylinded compound 4-8-0 type, rebuilt from an earlier Pacific type. The trailer axle of the Pacific type was replaced by a fourth driving axle to provide adequate adhesion on heavy grades with poor rail conditions. The use of this fourth pair of drivers led to a narrow firebox placed between the wheels. The grate has a width of 3 ft. 3 in. so that to secure the desired grate area of 40.5 sq. ft., a length of 12 ft. 5 in. was necessary. Mr. Chapelon says that in spite of its unusual length the firebox can be fired by hand without serious difficulty. This view is borne out by the fact that maximum firing rates of over 200 lb. of coal per sq. ft. of grate per hour were reached.

The flue bundle comprises 28 1¾-in. tubes, 30 5¼-in. flues carrying Houlet superheater pipes, and 86 Serve ribbed flues 2 9/16 in. outside diameter. The length between tube sheets is only 13 ft. 11¼ in. but this short flue length is offset by the fact that the flues have a high ratio of gas swept perimeter to fire area, and the efficiency of the flues in absorbing heat is satisfactory. The firebox is fitted with a Nicholson thermic syphon. The working steam pressure is 285 lb. per sq. in. The feed water is supplied by an ACFI feedwater heater and by one non-lifting injector.

The steam and exhaust passages in the cylinders were designed to provide ample areas and a free flow for the steam. Mr. Chapelon points out that it is normal practice to give the steam passages an area equal to about one-tenth of the area of the piston. In the rebuilt locomotives the steam passage area was increased to about one-fifth of the area of the piston. As a result the steam-pressure losses due to wire-drawing are exceptionally low. Distribution of steam to the cylinders is effected

* Railway engineer, Edgewater Steel Company, Pittsburgh, Pa.
† Reviewed in the December, 1938, and January, 1939, issues of the *Railway Mechanical Engineer*, pages 473 and 1, respectively.

by poppet valves with oscillating cams driven by Walschaert valve gear.

The exhaust nozzle is of the double Kylchap type with two stacks. Particular attention was given to the draft-

General Dimensions, Weights and Proportions of the Paris-Orleans-Midi 4-8-0 Type Locomotive

Railroad	Paris-Orleans-Midi
Type of locomotive	4-8-0
Weights in working order, lb:	
On drivers	168,000
On front truck	72,000
Total engine	240,000
Driving wheels, diameter outside tires, in.	72
Engine:	
Cylinders, number, diameter and stroke, in.:	
High pressure	2 – 17.3 × 25.6
Low pressure	2 – 25.2 × 25.6
Valve gear, type	Walschaert
Valves	Poppet
Boiler:	
Steam pressure, lb. per sq. in.	285
Thermic syphons, number	One
Plain tubes, number and diameter, in.	28 – 1.75
Serve tubes, number and diameter, in.	86 – 2.56
Flues, number and diameter, in.	133 – 5.24
Length over tube sheets, ft. and in.	13 – 11
Net gas area through tubes and flues, sq. ft.	5.32
Grate area, sq. ft.	40.5
Heating surfaces, sq. ft.:	
Evaporative, total	2,300
Superheating	722
General data, estimated:	
Rated tractive force, engine, lb.*	35,900
Factor of adhesion	4.68
Boiler proportions:	
Superheat surface, per cent evap. h. s.	31.4
Evap. heat surface ÷ grate area	56.8

* Rated tractive force is an arbitrary figure to represent the maximum cylinder effort exertable at the rim of the driving wheels at low speed. It is computed by assuming that the percentage of the boiler pressure available as mean effective pressure is 0.67 per cent in the high- and 0.25 per cent in the low-pressure cylinders.

ing to secure adequate draft with minimum back pressure in the cylinders.

Boiler Test Results

The original French text covers a very wide range of test data. For the present purpose the most significant data is translated into English units.

The relation between rate of firing, rate of evaporation, and boiler efficiency is shown in Fig. 1. The fuel used was a mixture of 60 per cent coal and 40 per cent of briquettes having a combined proximate analysis as follows: volatile matter, 19.0 per cent; moisture, 2.0 per cent; ash, 6.0 per cent, and heating value, 14,850 B.t.u. per lb. The firing rate was carried up to the high value of 245 lb. per sq. ft. per hr., so that it is evident that the coal was of excellent quality and well adapted for use in a locomotive firebox. In selecting a coal for this class of service the analysis and the heating value do not tell the whole story. It is essential that the coal stay on the grate in spite of the vigorous forced draft, and this requires a coal which cokes well. Mr. Chapelon calls attention to this and points out that no standard method has been adopted for measuring this important quality of the coal. The point is worth further study. Information developed during the tests of the Paris-Orleans locomotives shows that differences in coals which are not distinguishable by the usual tests for composition and heating value may have a considerable effect on the efficiency of combustion in a locomotive firebox. For the French tests two coals designated as *A* and *B* were available. The only difference between them was that *B* had been in the stock pile longer. Analyses and heating value were practically identical, but owing to the loss of coking power during stocking the *A* coal gave considerably less efficiency in the locomotive firebox. This is shown by the difference between the lines *A* and *B* in Fig. 1. At a firing rate of 145 lb. per sq. ft. of grate the boiler efficiency was 69 per cent with coal *B* and only 63 per cent with coal *A*. The explanation given is that the coal *B*, because of its better coking quality, formed a solid spongy mass on the grate. Although this gave a denser firebed requiring a greater smokebox draft than coal *A*, the scrubbing action of the air in the pores of the mass gave more intimate contact and better combustion.

Fig. 1 shows that the boiler could be driven to a firing rate of 245 lbs. per sq. ft. of grate per hour, a total of 9,900 lb. of coal per hour, giving an evaporation of 52,000 lb. of water per hour.

No information is available as to the weight of air utilized in combustion. Mr. Chapelon, unfortunately, does not accept the method used in this country for computing a heat balance from gas analyses, and no gas analyses are reported, nor are any definite figures given for smokebox temperatures. In the absence of this data it is not possible to break down the over-all boiler efficiency into its component parts, efficiency of combustion and efficiency of heat absorption. This would have been of particular interest because of the shortness of the flues which are less than 14 ft. long and the use of the Serve flues with longitudinal internal ribs increasing the flue surface in contact with the gases. This gives a high ratio of gas swept perimeter to area and increases the heat absorbing efficiency.

The over-all boiler efficiency of 61 per cent with a firing rate of 200 lb. per sq. ft. of grate per hour compares favorably with current American practice, but it seems probable that this is largely due to a relatively high efficiency of combustion made possible by the excellent quality of the coal used.

Values for the smokebox draft in relation to the rate at which steam is produced and exhausted are shown by the curves in the left-hand panel of Fig. 2. For comparison a line is drawn to represent typical American practice. Fig. 2 serves a triple purpose. The curves in the right-hand half show the relation between smokebox draft and back pressure, while the curves in the left-hand half show the relation between rate of steam discharge and back pressure. By projection across as in the line

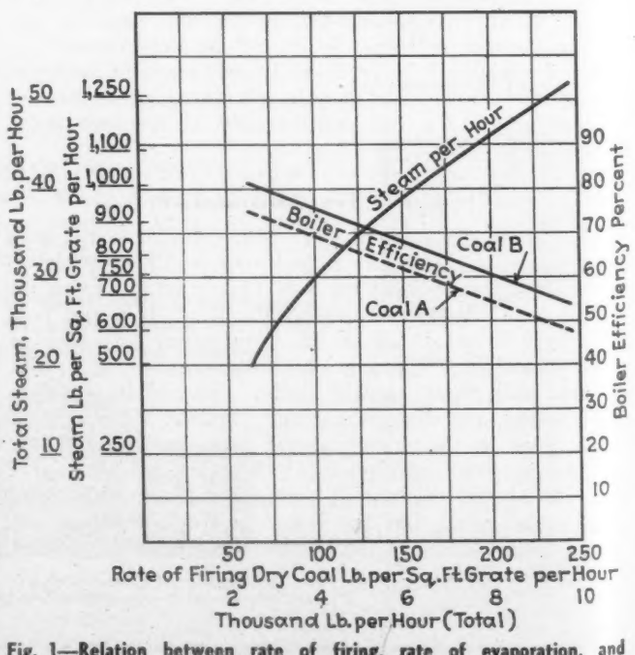

Total Steam, Thousand Lb. per Hour
Steam Lb. per Sq. Ft. Grate per Hour
Boiler Efficiency Percent
Steam per Hour
Boiler Efficiency
Coal B
Coal A
Rate of Firing Dry Coal Lb. per Sq. Ft. Grate per Hour
Thousand Lb. per Hour (Total)

Fig. 1—Relation between rate of firing, rate of evaporation, and boiler efficiency

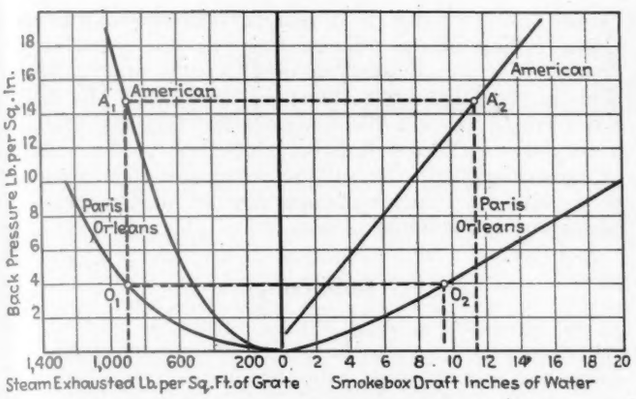


Fig. 2—Relation between rate of steam discharge and back pressure and between smokebox draft and back pressure

$0_1 0_2$, the relation between steam production and draft is established. The dotted line $0_1 0_2$ as drawn shows that the Paris-Orleans locomotive produces 900 lb. of steam per sq. ft. of grate per hour with a back pressure of 3.8 lb. per sq. in. and a smokebox draft of 9.4 in. of water. For comparison, curves representative of American practice have been drawn. The line showing the relation between back pressure and draft is that given in the 1936 report of the A. A. R. Committee on Locomotive Construction as typical. The values given are for draft back of the diaphragm, the curve showing the relation to steam exhausted. Using these curves it is seen from the line $A_1 A_2$ that to produce 900 lb. of steam per sq. ft. of grate per hour in American practice a back pressure of about 14.8 lb. per. sq. in. might be expected with a smokebox draft of about 11.4 in. of water. From these figures it appears that the Paris-Orleans locomotive produces steam with a lower draft, 9.2 in. against 11.2 in., than is to be expected in American practice. The meaning of this cannot, however, be determined in the absence of information as to the rate at which air is supplied. Low draft values may be due to lower rates of air supply, or to less resistance to the flow of the air through the firebed or through the flues.

However this may be, it is important to notice the very low back pressure required to produce the draft. A draft of 11.2 inches of water back of the diaphragm requires a back pressure of 14.6 lb. per sq. in. according to the Locomotive Construction Committee curve, while the Paris-Orleans locomotive needs only 5.0 lb. per sq. in. The reduction of 9.6 lb. per. sq. in. means a very considerable gain in power. In a locomotive with cylinders 22½ in. by 29 in. with 79-in. drivers, this pressure represents a tractive force of 2,300 lb., or 460 hp., at 75 miles per hour. This reduction in cylinder loss would all be net gain at the tender drawbar and under the conditions indicated may represent 10 to 12 per cent increase in tender drawbar pull.

The possibility of such savings gives the Paris-Orleans front-end considerable importance. The arrangement comprises two exhaust nozzles with Kylchap distributors and two stacks. The two nozzles have a combined area of 31 sq. in., equivalent to a single nozzle of approximately 6⅝ in. diameter. The cylinders discharging steam through these nozzles have a diameter of 25.2 in., an area of 500 sq. in. each.

Each exhaust nozzle is set low in the smokebox, with four Goodfellow bars, and discharges into the bell mouth of a Kylchap distributor. This separates into four passages and discharges into a petticoat pipe which in turn discharges into the bell mouth of the stack near the top of the smokebox. Gases can be drawn in between nozzle and distributor, between distributor and petticoat pipe, and between petticoat pipe and stack. The two stacks have a combined area of 405 sq. in. at the throat, equivalent to a single stack of 22¾ in. diameter.

Cylinders Tests

The test data for the engine performance provides interesting food for thought. The use of the steam has been very carefully studied by the French designers and the result is a cylinder performance which ranks very high for power and efficiency. As shown in the table of dimensions, the engine is a compound with two high-pressure cylinders 17.3 in. by 25.6 in. and two low-pressure cylinders 25.2 in. by 25.6 in. Each pair of cylinders has an independent valve motion of the Walschaert type operating poppet valves.

In designing the engine, special attention has been given to:

(a) Delivering the steam to the high pressure cylinders with high superheat and the least possible drop below the working boiler pressure.

(b) Proper division of power development between the high- and low-pressure cylinders and delivery of steam from the high- to the low-pressure cylinders without undue loss.

(c) Exhaust of steam from the low-pressure cylinders with the least possible back pressure.

The work has been carried out so successfully that at 68 miles an hour in the range between 2,200 and 3,000 i. hp., the steam consumption is constant at 11.6 lb. per i. hp. hr. and even when pushed to the maximum of 3,200 hp. at this speed, the steam rate does not rise above 13 lb. per i. hp. hr. This high efficiency plays a large part in making it possible for a 120-ton locomotive to develop 3,700 hp., which is one hp. for 65 lb. of locomotive weight.

Delivery of Steam to Cylinders

The condition of the steam delivered to the cylinders in relation to rate of operation is shown is Fig. 3. The steam temperature is high, rising from about 715 deg. F. at a steam production of 20,000 lb. per hour to about 790 deg. F. at the maximum output of 50,000 lb. of steam per hour. One of the points in design emphasized by Mr. Chapelon as important is that these high temperatures are obtained with only a small drop in steam pressure between boiler and steam chest. With a boiler pressure of 285 lb. per sq. in. the steam chest pressure is not lower than 275 lb. per sq. in. at the maximum rate of 50,000 lb. of steam per hour. At the more normal working rate of 40,000 lb. of steam per hour the pressure

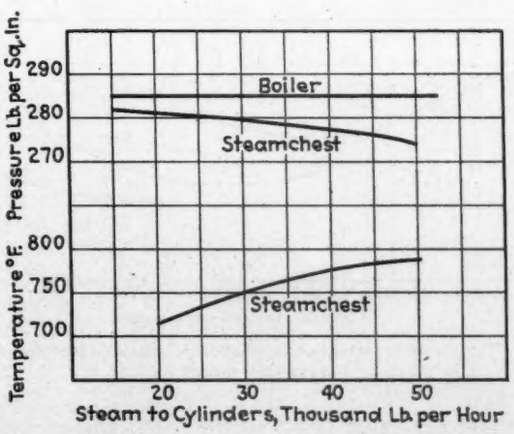


Fig. 3—The condition of the steam delivered to the cylinders in relation to the rate of steam consumption

drop is only about 7 lb. per sq. in. These figures are about half of what might be expected in current American practice.

Reduction in the pressure drop between boiler and steam chest is of value on two counts. In the first place loss of pressure in the steam chest means a reduction in mean effective pressure. It has been shown above that avoidance of this loss may provide a very considerable

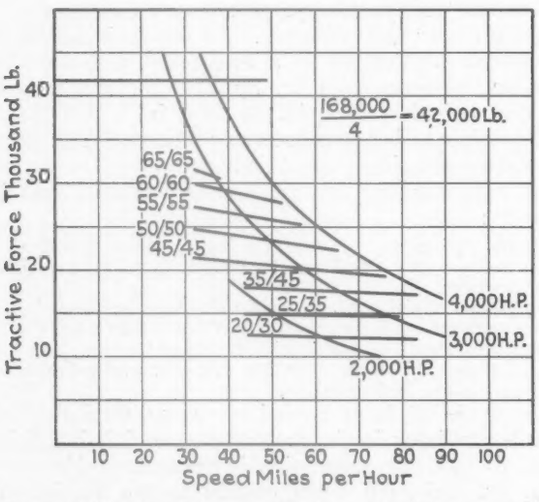


Fig. 4—Indicated cylinder tractive force in relation to speed

gain in drawbar pull. In the second place a loss of pressure reduces the efficiency with which the steam can be expanded. Loss of steam pressure without work being done increases the entropy and therefore reduces the efficiency with which the steam can be expanded through a given range of pressure. Being an irreversible charge it allows the energy to go over into a form in which it cannot be utilized. The effect is very similar to that of friction when mechanical work is being done.

If all possible efficiency is to be obtained, the loss of pressure between boiler and admission ports must be reduced to a minimum. A point emphasized by Mr. Chapelon is that in order to prevent wire-drawing during

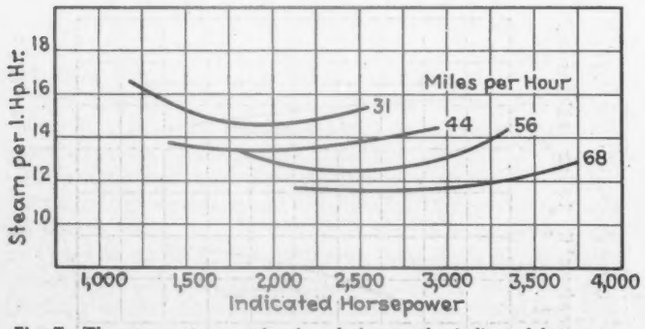


Fig. 5—The steam consumption in relation to the indicated horsepower at various speeds

admission the valve chest should have ample capacity. A volume at least equal to that of the high-pressure cylinder is recommended.

Utilization of Steam in Cylinders

The power developed and the efficiency with which the steam is used are shown, respectively, in Figs. 4 and 5.

Indicated cylinder tractive force in relation to speed is shown in Fig. 4. The lines sloping down from left to right give the tractive force for various cut-offs. Each line is marked with the cut-off in high- and low-pressure cylinders. Attention is drawn particularly to the very slight falling off in tractive force as the speed is increased. At the shorter cut-offs there is practically no drop in tractive force as the speed increases. The steam flows freely through the cylinders at any speed and the horsepower increases in direct proportion to the amount of steam supplied. This is the result of reducing as far as possible resistance to steam flow in superheater and admission and exhaust passages.

Efficiency

The efficiency with which the steam is used in the cylinders is shown by the series of curves in Fig. 5. These plot the water per i. hp. hr. against i. hp. for various speeds. The values are low, showing high efficiencies through the range of operation. It is of particular interest to note the flatness of the curves showing, for each speed, only a moderate rise in water rate as the horsepower is increased by lengthening the cut-off. The curve for 68 m. p. h., 320 r. p. m., shows a water rate not over 12 lb. per hp. hr. for the range between 2,300 and 3,300 i. hp. Even when pushed to the maximum capacity of 3,700 hp. the water rate is only 13 lb. per hp. hr. Essential for high engine efficiency are, (a) that the steam carry adequate heat energy available for transformation into mechanical work, and (b) that the cylinders provide a high ratio of expansion to effect this transformation. In the Paris-Orleans locomotive the available heat energy is supplied by steam-chest pressures of 280 to 275 lb. per sq. in. and temperatures of 720 deg. F. to 780 deg. F. The opportunity for high rates of expansion is afforded by the use of compound cylinders. The high-pressure cylinders are 17.3 in. by 25.6 in., and the low pressure 25.2 in. by 25.6 in. giving a volumetric ratio of 1 to 2.12. With a cut-off of 25 per cent in the high-pressure cylinder, this gives an expansion ratio corresponding to a cut-off of about 12 per cent in a single-expansion cylinder.

The cylinder efficiency depends on having a high ratio of expansion such as this, but apart from the mechanical difficulty, the efficiency would not be so high if carried out in a single cylinder. The temperature drop between steam chest and exhaust is approximately 475 deg. F. This variation in a single cylinder would give rise to considerable cylinder-wall action reducing the efficiency. By dividing the expansion between two cylinders, the temperature range is practically halved with a corresponding improvement in cylinder efficiency.

In reporting the results obtained with the Paris-Orleans locomotive, Mr. Chapelon notes that at maximum power the i. hp., 3,700 to 4,000, is practically the same as the New York Central J1a. The Paris-Orleans locomotive is of the 4-8-0 type with 40.5 sq. ft. of grate. It weighs 240,000 lb. total with 168,000 lb. on drivers. The J1a, of the 4-6-4 type, has 81.4 sq. ft. of grate and a total weight of 340,000 lb. with 182,000 lb. on drivers. At the same speeds and cylinder horsepowers the lighter locomotive will be able to deliver considerably greater power at the tender drawbar.

Conclusion

This demonstration of locomotive efficiency obtained by attention to details of design offers a challenge to American locomotive engineers. High speeds are being demanded, and for high speeds, reduction in locomotive weight is of the first importance. The Paris-Orleans results raise a question as to the gains that might be made by the use of an improved front end and high boiler

(*Continued on page 352*)

Steam Locomotive

Poppet Valve Gear

Franklin system for use in America provides separate intake and exhaust-valve events—Each set of valves is driven by an oscillating cam—Both are controlled by a single reverse gear

For the past two years the Franklin Railway Supply Company, New York, has had under development a poppet-valve application and oscillating-cam driving mechanism which permits the separation of the control of the admission and cut-off events from that of the release and compression events. This has previously been possible only with the rotary-cam type of drive. Two oscillating cam shafts are employed, one for the intake valves and the other for the exhaust valves. The valve events are subject to control in practically unlimited steps by a single reverse mechanism. The functions of the cam-shaft driving mechanism are analogous to those of a Walschaert valve motion, with separate links for the intake- and exhaust-valve cams. A reverse mechanism controls the differential movements of the two sets of link blocks to permit practicable working at cut-offs much shorter than can be utilized with a piston valve or with poppet valves controlled by a single oscillating cam shaft.

There are three major parts to the Franklin device—the gear box, which contains the valve motion for driving the cam shafts, including the reverse mechanism; the cam box, and the steam chests over the ends of the cylinders in which the poppet valves are installed. The valve installation and cam box follow, in principle and in detail, the developments of the Societe d'Exploitation des Procedes Dabeg on the Continent of Europe and Associated Locomotive Equipment, Ltd., in England. The valve motion is entirely new. It has been developed in collaboration with the engineers of the Lima Locomotive Works, Inc.

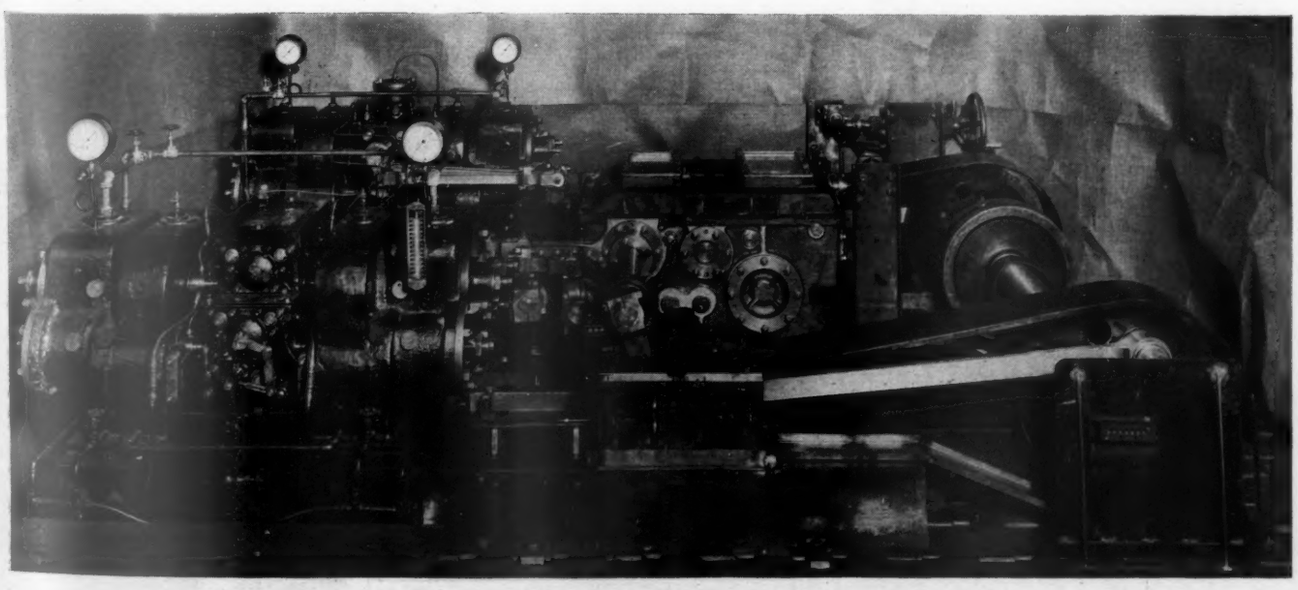
The Cam Box

A cam box is placed on top of each cylinder between the two steam chests, which are located over the ports of the cylinder. It contains two oscillating cam shafts, that on the top for operating the intake valves and that at the bottom for operating the exhaust valves. Instead of a single valve each for intake and exhaust, there are two intake and two exhaust valves. In this way the valves are kept small and light. The small valves are easily ground and kept steam-tight and their grouping around the port results in small cylinder clearance. For instance, on the 27-in. by 28-in. cylinder, the intake valves are 6 in. in diameter and the exhaust valves 7 in. in diameter, and the cylinder clearance is 8.4 per cent, although the port openings are considerably larger than in a conventional cylinder. The steam chests in which the valves are installed are cast integral with the cylinder.

Valve spindles extend through the inner wall of the steam chest and the springs which return the valves and spindles to closed position are located in sleeve caps secured to the steam-chest heads. The intake chamber proper is on the outside of the port and the exhaust cavity on the inner side, next to the cam box. The cam-box tappets line up with the ends of valve spindles. The maximum valve lift is 1 in. The cam box is lubricated by an oil pump driven from one of the cam shafts.

The Gear Box

The gear box is 55⅜ in. long by 32¾ in. wide, and 24⅝ in. high. It contains the complete valve motion



Side view of the test plant after the installation of the redesigned gear box

Comparison of Valve Events of Piston Valve with Walschaert Motion and the Franklin Steam Distribution System with Oscillating-Cam Poppet Valves

Cylinders, 21¼ in. by 26 in.; piston valve, 12 in. diameter; maximum travel, 7½ in.; poppet valves—two intake, 5½ in. diameter; two exhaust, 6 in. diameter.

	Cut-off, per cent	Pre-admission, per cent		Release, per cent		Compression, per cent		Max. Port Area at the Valves, sq. in.			
								Admission		Exhaust †	
		Piston valves	Poppet valves	Piston valves	Poppet valves	Piston valves	Poppet valves	Piston valves	Poppet valves	Piston valves	Poppet valves
Min.	7.26	7.26*	7.26	44.1*	83.8	44.1*	24.0	9.59*	16.9	63.3*	48.4
	10.00	5.20*	5.20	48.7*	85.5	39.9*	21.5	9.76*	18.0	63.3*	48.4
	15.00	3.33*	3.33	54.7*	87.5	34.2*	18.9	11.05*	20.2	63.3*	48.4
	20.00	2.46*	2.46	59.6*	88.9	29.9*	17.1	12.73*	24.6	63.3*	48.4
	25.00	1.80	1.80	63.9	89.9	26.2	15.6	14.99	28.3	63.3	48.4
	30.00	1.47	1.47	67.6	90.6	23.2	14.4	17.40	33.3	63.3	48.4
	35.00	1.20	1.20	70.7	91.3	20.8	13.5	20.40	36.8	63.3	48.4
	40.00	1.00	1.00	73.7	92.3	18.4	12.1	23.02	39.8	63.3	48.4
	50.00	0.67	0.67	78.9	93.4	14.3	10.3	30.8	39.8	63.3	48.4
	60.00	0.53	0.53	83.7	94.4	10.9	9.2	41.3	39.8	63.3	48.4
Max.	70.4	0.33	0.33	88.4	95.8	7.6	6.7	57.5	39.8	63.3	48.4

* With piston valves cut-offs below 25 per cent are impracticable in operation. The figures indicate the kinematics of the Walschaert valve motion, although, in practice, cut-offs less than 25 per cent are impracticable.

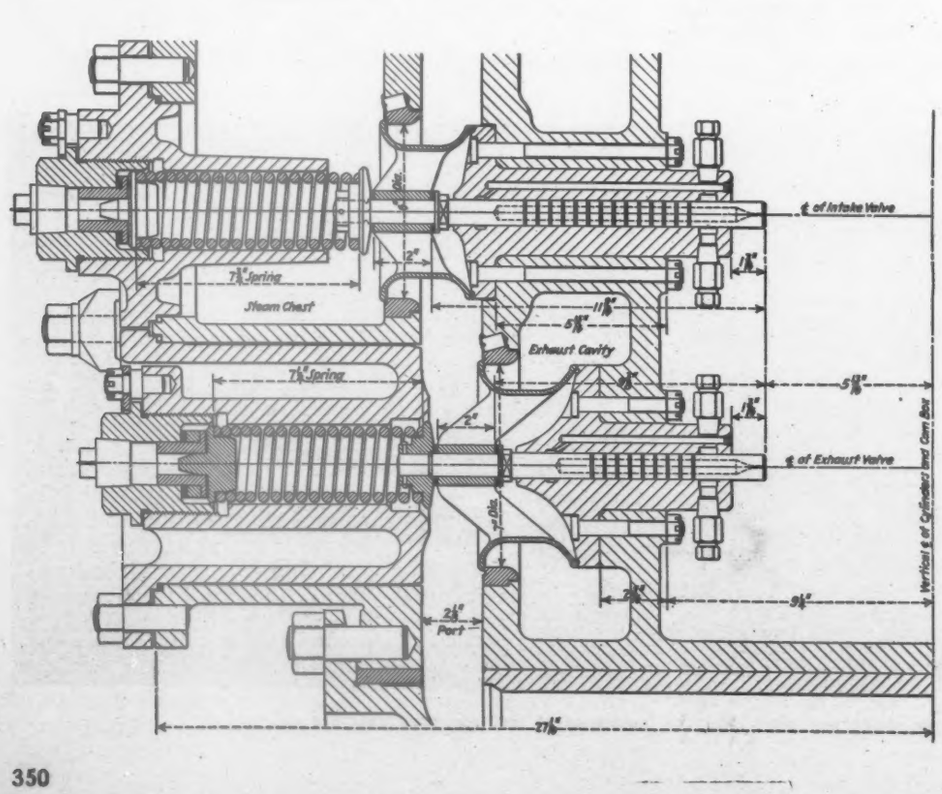
† The areas shown are those through the valve-bushing ports in the case of the piston valve and the areas through the valves in the case of the poppet valves. Actual admission to the cylinders is limited by the area of the port through the cylinder bushing. These are, respectively, 37.9 sq. in. for the piston-valve locomotive and 38.72 sq. in. for the poppet-valve locomotive.

which operates independently the intake and exhaust cams for both cylinders of the locomotive. It may be located between the frames immediately back of the cylinders, or on the deck in front of the cylinders.

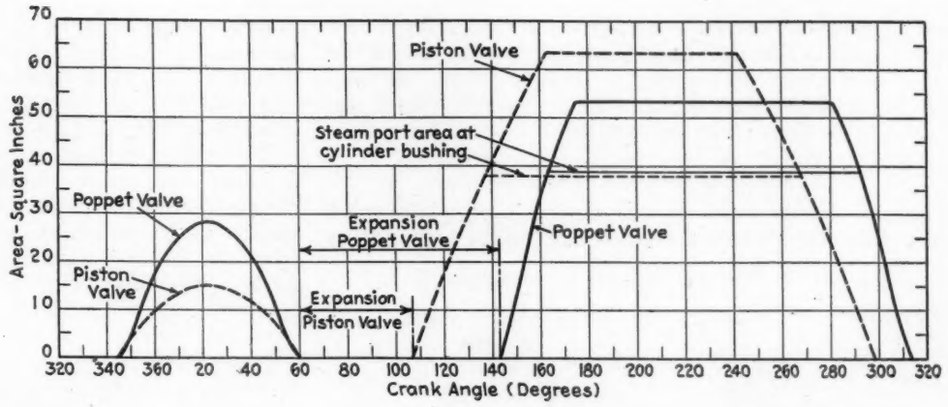
The gear box is driven from the two crossheads through union links attached to arms on the ends of the two drive shafts, which enter the box one on each side. Each drive shaft, therefore, oscillates in unison with the crosshead on its side, and the oscillating motions on the right- and left-hand sides are, of course, in 90-deg. phase. In the gear box, these two oscillating motions are combined by means of radial links and combining levers into four oscillating motions, two for the intake-cam motions and two for the exhaust-cam motions. The radial links and combining levers perform much the same function as the Walschaert gear links and combining levers. However, in the gear box there are two radial links for intake motion and two radial links for exhaust motion, and these links are mounted in pairs, both the intake link and the exhaust link of each pair moving in unison. The radial links for the valve motions on one side of the locomotive are derived from the oscillating shaft driven by the crosshead on the opposite side of the locomotive, while the combining levers, one for each link, receive their motion from the oscillating shaft driven from the crosshead on the same side of the locomotive. The separation of the intake and exhaust motions is secured by a differential location of the respective link blocks in the links.

The Reverse Gear

The differential control of the intake and exhaust link blocks is by means of an interrupted gear arrangement which is operated from the reverse gear in the cab. This arrangement moves the link blocks differentially in such a way that when the intake link blocks are in the minimum cut-off position (mid-link), the exhaust link blocks are set approximately for 84 per cent release and 24 per cent compression. This may be called mid-gear for-



Details of the valve chamber and poppet-valve installation for a 27-in. by 28-in. cylinder



Comparison of the expansion and effective valve areas at 25 per cent cut-off on a 21¼-in. by 26-in. cylinder — The piston valve is 12-in. in diameter, the two intake poppet valves 5½-in. in diameter, and the two exhaust poppet valves 6 in. in diameter

ward position. At this point, the interrupted gear train continues to change the position of the exhaust link blocks and to hold the intake-link blocks stationary in the link until mid-gear reverse is reached, at which point the exhaust link blocks are set for approximately 84 per cent release and 24 per cent compression (reverse motion). From this point, both intake and exhaust blocks move differentially until full-gear reverse position is reached.

It will be noted that this provides a control at the cab reverse gear having a zone of movement from full-gear forward to mid-gear forward, a neutral zone from mid-gear forward to mid-gear reverse, and a reverse zone from mid-gear reverse to full-gear reverse. This has the advantage that the engineman can cut back to mid-gear forward with no fear of going into reverse because, should he slightly overrun his gear, no harm will result. Moreover, in the center of the neutral zone, provision is made for automatically cutting in the drifting arrangement, which lifts all the intake valves from their seats to full open position. Experience has shown that this provides ample areas between the ends of the cylinders, thus resulting in free drifting.

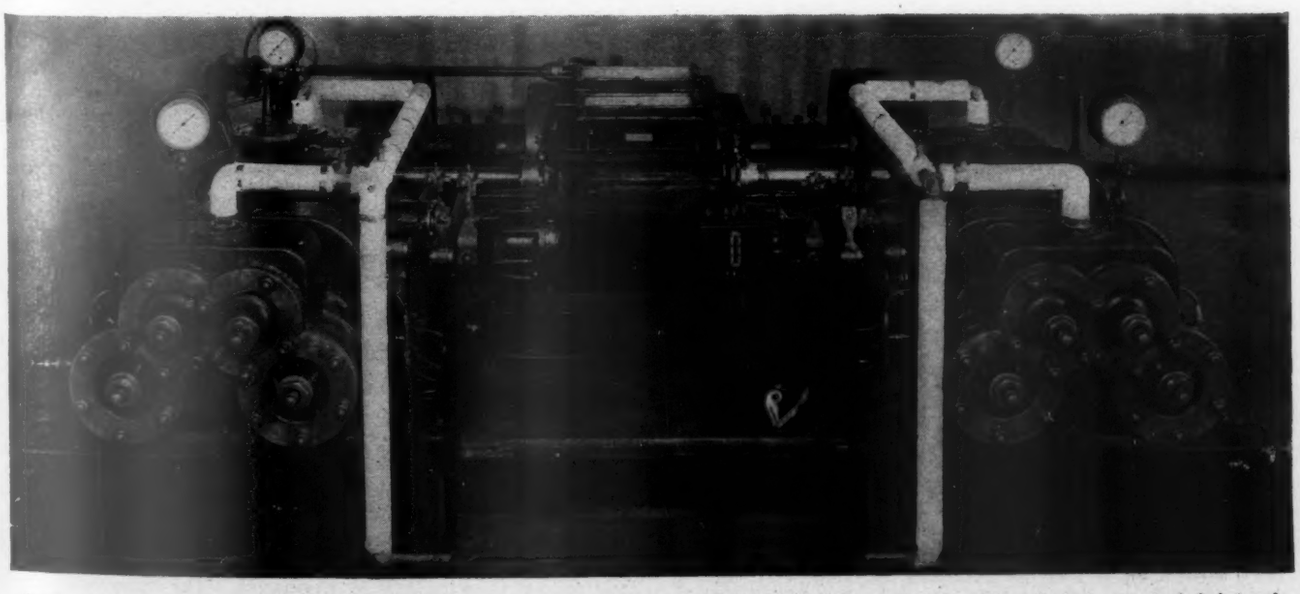
The gear box is completely enclosed and the parts operate in an oil bath. Needle bearings are installed throughout, including the roller link blocks. The total weight of the gear box is 3,600 lb. The cam box and the gear box are removed from, and replaced on the locomotive each as a complete assembly. For the purpose of proper valve-setting reference points on the cylinders, the gear box, and the cam boxes permits accurate adjustment of the lengths of gear-box and cam-box connecting rods by means of shims between the bodies of the rods and the stub ends.

Operating Characteristics

The separation of the release and compression events from the admission and cut-off events makes it possible to operate effectively at a minimum cut-off of 7.26 per cent. A comparison of the events produced by a Walschaert valve gear driving a 12-in. piston valve and by the Franklin gear with two 5½-in. admission valves and two 6½-in. exhaust valves, both operating on 21¼-in. by 26-in. cylinders, is shown in the table. This clearly indicates the effectiveness with which release and compression are delayed so that, at the 7.26-per cent cut-off, the release with the poppet valves is practically as late as at 60 per cent cut-off with the piston valve driven by the Walschaert gear, and compression compares with that of the piston valve at between 25 and 30 per cent cut-off.

This table also shows the greater maximum area through the intake valves throughout the entire range of cut-offs. The comparative effect of this in port area times the time available for the passage of steam is illustrated for the 25-per cent cut-off.

The relation between intake-valve events and release

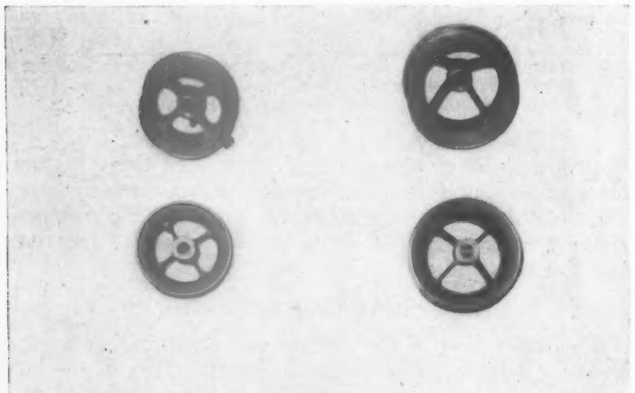


Front view of the steam chests—The gear box occupies a position immediately behind the cylinder saddle which is not included in the laboratory installation

and compression events is not limited to the values shown in the table. The interrupted gear arrangement and the cams can readily be changed so that practically any desired relation between intake-valve events and release and compression events can be obtained.

Development of the Gear

In the development of this device a complete valve gear with cam boxes, full size castings of the steam-chest



Comparative sizes of poppet valves and 12-in piston valve—The two 6½-in. exhaust valves weigh 3 lb. 13 oz. and the 5½-in. intake valves, 2 lb. 12 oz. each—The piston valve weighs 132 lb.

portions of the cylinders, and a complete installation of intake and exhaust valves was set up in the laboratory and operated by a motor-driven crank shaft and crossheads. After preliminary trials this equipment was operated 24 hours a day at a speed of 350 r. p. m., equivalent to 83 m. p. h., with 80-in. driving wheels and at times at speeds as high as 500 r. p. m. Except for shut-downs for examination, this was continued until an equivalent mileage, based in 80-in. drivers, of 155,000 had been accumulated.

During this intensive operation stroboscope studies showed clearly where undesirable flexure occurred at high speeds and, as a result, alterations in the design of parts were made to stiffen up the entire motion. Finally, a complete new gear box was designed involving all of the changes which the tests indicated desirable. The result has been that, operating at 500 r. p. m., there is no sign whatever of the slightest distortion or over-travel in the oscillating motion of the cams or in the movement of the valves themselves.

One of the inherent advantages of poppet valves is the small amount of power required to operate them. During the laboratory tests of the development set the horsepower required to operate the valve motion and the valves varied from 0.05 at 210 crankshaft r. p. m. to 3.30 at 500 crankshaft r. p. m. The power absorbed varies only with the speed and is not affected by changes in cut-off at a given speed. The Walschaert gear and piston valve absorbs as much as 50 hp. at 300 r. p. m. The small power consumption of the poppet-valve motion reflects the fact that its parts are produced by precision methods, that it is completely equipped with anti-friction bearings, and that it is thoroughly lubricated, as well as the fact that the driven parts are of light weight.

The conditions under which the gear box and the cam box and valves of the development set were operated are closely identical with the conditions encountered in actual locomotive operation, with the exception that the valves were not under pressure and passed no steam. Spring loading was added, however, to compensate for the unbalanced area of the valves.

In the tests of the first gear box approximately 90 per cent of the pins and bearings showed no appreciable wear after 155,000 miles and were in condition for further service. The remaining 10 per cent were replaced on account of design changes. All of the parts in the second gear box have covered 35,000 miles to date.

High Locomotive Efficiencies

(*Continued from page 348*)

pressure with the high ratio of expansion made possible by compound cylinders.

Compounding was widely used in this country some forty years ago, but disappeared from the picture for reasons not in any way connected with the principle. With the high- and low-pressure cylinders superposed and driving a common crosshead, obvious mechanical difficulties gave sufficient cause for discontinuance. The four-cylinder balanced compound was a better design. The only weak point was the crank axle. The space available between the frames is so narrow that there is no room for a crank axle with sufficient strength and enough bearing area for the main pins. In a locomotive with four outside cylinders, in the modern American style, this particular difficulty would be eliminated. Other difficulties would be encountered, but there is no reason to believe that they would be insurmountable.

High speeds are in demand, requiring greater power. Under these conditions, improved efficiency giving greater power without increase in weight is particularly desirable. At lower speeds it has been thought from time to time that the ceiling of power had been reached, but with further effort more power has been obtained by some increase in efficiency, but mainly by an increase in size.

For really high speeds, increase in efficiency becomes of the first importance. The inexorable opposition of mass to acceleration puts a premium on light weight for a high-speed locomotive.

Looking on from the sidelines, it seems to this observer that there is an opportunity for an American revival of compounding. A designer who would combine this with other opportunities for engine efficiency might go far in improving the already high standing of the reciprocating steam locomotive.

A HIGHWAY PASSENGER "TRAIN", 70 ft. in length and comprising two coupled units connected by a flexible passageway, has been introduced on an express motor highway between Berlin and Munich, Germany, via Dessau, Leipsig and Halle. Named the "Gaubschat" train after its inventor, the vehicle weighs 33,069 lb., is powered by a 150-hp. Diesel engine and has seating capacity for 78 passengers. The round-trip fare between its termini is quoted at 30 reichsmarks ($12), as compared with the cheapest rail rate of 40 reichsmarks ($16).

Lehigh and New England

Cement Hopper Cars

Cars built by American Car and Foundry Company of welded construction—They can be loaded to 78 tons and are capable of dumping this load in 22 min. —The capacity is 1,790 cu. ft.

WITH the recent delivery of 50 bulk cement cars with hatchway roofs and hopper bottoms the Lehigh & New England now has in service a total of 175 cars of this type, all built by the American Car and Foundry Company during the past two years.

These cars have contributed materially to an increase in the volume of cement traffic handled by the road. They have proved especially convenient for contractors using cement on large concrete projects, such as dams, highways, bridges, piers, etc., because of the ease and economy with which the cars can be loaded and unloaded.

This type of car is also adapted to the handling of other bulk commodities such as sand, lime, dolomite, carbon black, solid chemicals, paint pigment, wood flour, Fuller's earth, powdered coal, etc. With a lading of 400 barrels of cement per car, the cars can be unloaded into the ordinary track hopper in approximately 60 minutes and into the usual single-screw conveyor unloader in about two hours. In one instance, a car of this type was unloaded into a chute leading to a floating barge in 22 minutes using all four gates simultaneously. The amount of cement discharged in this instance was 78 short tons.

An outstanding feature of these cars is the use of fusion-welded butt joints wherever the lading comes into contact with the inside surfaces of the hopper sheets, thereby eliminating projections such as rivet heads, weld beads, or projections of any kind which tend to slow up or even stop the discharge of lading from a hopper. Further, to prevent any such happening, all weld beads in contact with the lading are ground off flush with the plate surface.

Cars Have Twin Hoppers

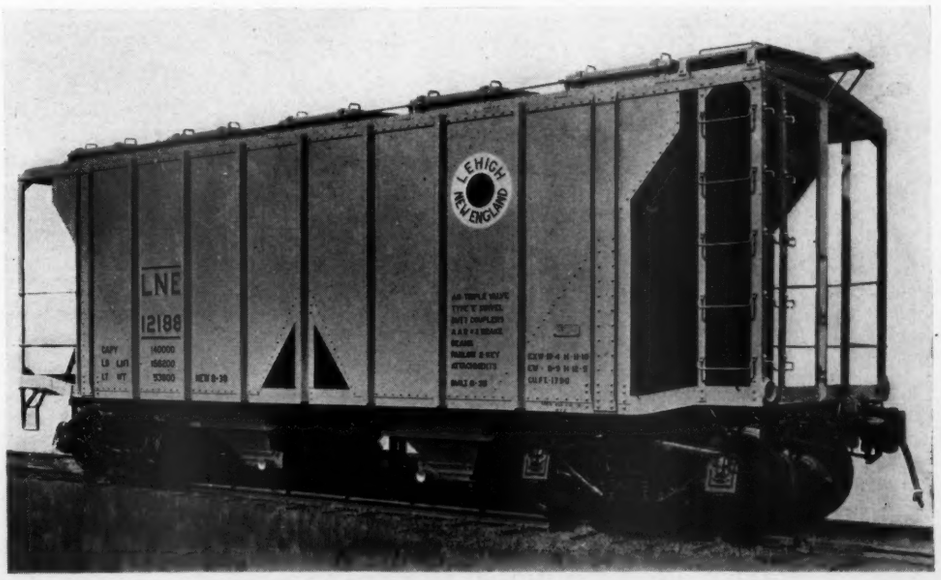
These cars are of the twin-hopper type with four sliding gate-valve type outlets and a roof with 10 watertight hatches for loading. The general design of the hoppers follows the typical construction of a coal hopper, except that this car has a center partition sheet across the car at the cross ridge, and the gate-valve type outlets. The material used is open-hearth steel, except that plates ¼ in. and under are copper-bearing steel.

The end floor sheets and the outside hopper sheets slope at 50 deg. and the cross-ridge sheets slope at 60 deg. from the horizontal.

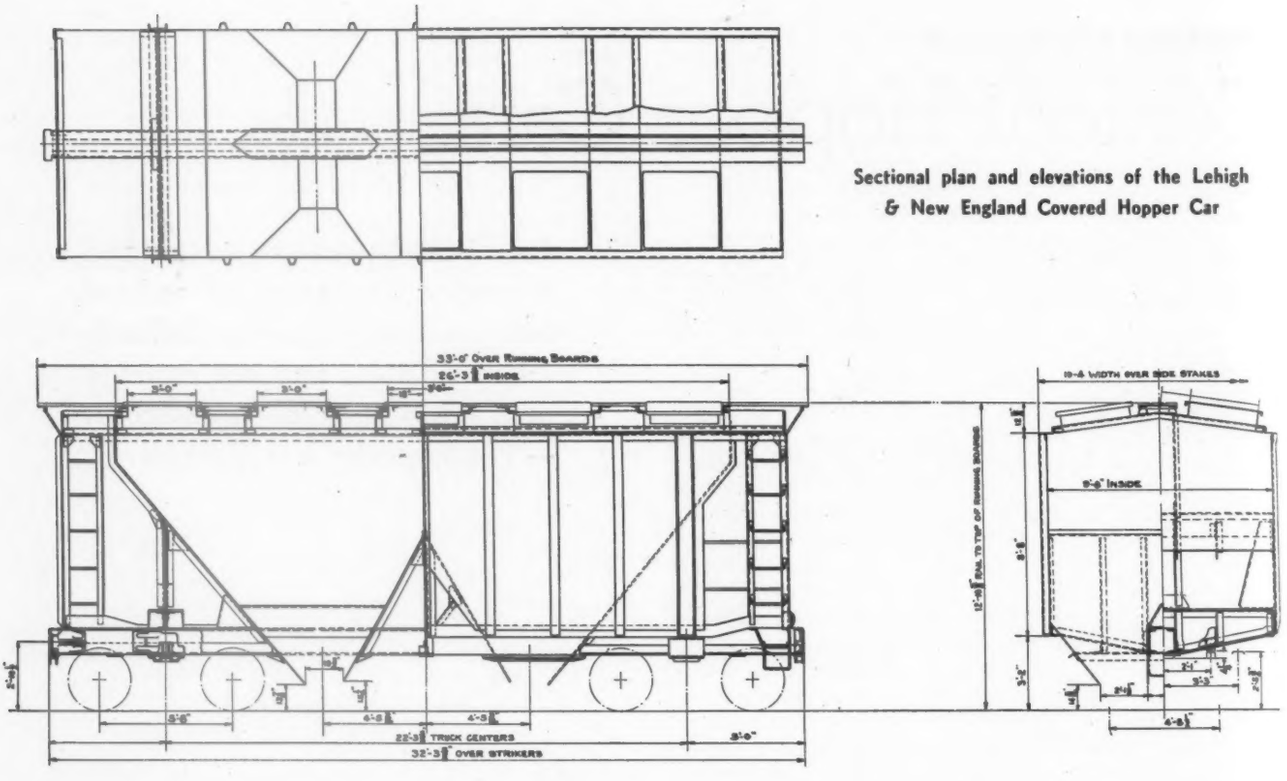
The side construction consists of 3/16-in. sheets; 6-in. by 3½-in. by ⅜-in. side-sill angles and 4-in., 10.3-lb. Z side plates. The side posts are 5/16-in. U-shaped pressings welded to the outside of the side sheets. A 9-in. 15-lb. channel on the outside of the side sheets forms the

Principal Dimensions and Weights of L. & N. E. Cement Cars

Length over striking plates, ft.-in.	32– 3⅝
Length inside, ft.-in.	26– 3⅝
Width inside, ft.-in.	9– 8
Width overall, ft.-in.	10– 4
Height, rail to side plate, ft.-in.	11–10
Distance between truck centers, ft.-in.	22– 3⅝
Truck journals, in.	6 x 11
Truck wheelbase, ft.-in.	5x 8
Light weight, lb.	53,800
Weight of car body, lb.	34,680
Weight of trucks, lb.	19,120
Load limit, lb.	156,200
Cubic capacity, cu. ft.	1,790



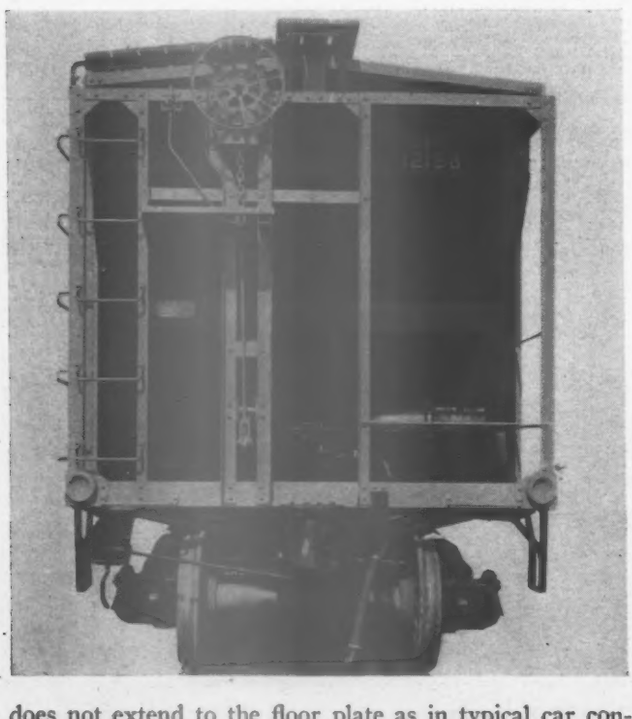
Lehigh & New England
70-ton cement car



Sectional plan and elevations of the Lehigh & New England Covered Hopper Car

bolster posts. The center sills consist of two, 13-in., 35-lb. channels with a ⅜-in. cover plate extending from striking casting to striking casting.

The bolster is of web-plate and chord-angle construction with top and bottom cover plates. The web plate



does not extend to the floor plate as in typical car construction. The end floor sheets are supported over the bolsters by vertical angles at the center, connected to the bolster, and extending to a ⅜-in. plate bent to fit the slope of the floor sheets and extending the full width of the car. This plate is further supported at the side by a large vertical ¼-in. gusset plate extending to the top of the bolster and riveted to the bolster post forming a rigid construction at this point.

The end floor sheets are also supported and reinforced by angles extending from the roof down the slope of the sheets to the center of the sill in two pieces. They are welded to the floor sheets and riveted to the center sills and angles over the bolsters. Two intermediate angle stiffeners are welded to the underside of the floor sheets and extend from the ⅜-in. transverse plate stiffener to a point level with the center sill.

A ¼-in.-plate longitudinal hood covers the center sills between the floor sheets and the cross-ridge sheets. All fabrication in the interior of the car, 3 in. below the eaves, is arc welded with welds finished to a smooth surface so as to prevent lading from adhering to it.

Ten Hatches in the Roof

The roof consists of No. 11 gage copper-bearing steel sheets riveted to angle carlines. Hatch door openings, 3 ft. by 3 ft., are spaced equally, five on each side of the longitudinal center line of the car. Hatch frames of 5/16-in. copper-bearing steel, 5½ in. high, are provided with hinged covers of No. 11 gage copper-bearing steel. Asphaltum paper is applied to all roof joints to insure a water-tight roof. Hatch-door locking bars extend the full length of the car on each side. Each bar is locked at both ends of the car between two end doors with a seal-pin arrangement. The bars have sufficient tension in the arms to insure a door being held water-tight.

Enterprise cast-steel frames and gates are welded to each hopper outlet. The lowest point of the frame is 9 in. above the top of the rail.

The 70-ton trucks are A. A. R. double-truss type with cast-steel integral-box side frames and bolsters. They are fitted with coil-elliptic springs and chilled-iron car wheels. The cars are equipped with AB brakes furnished by Westinghouse. One of these cars is a part of the railroad exhibit at the New York World's Fair.

Double-Glazed Sash For Air-Conditioned Cars

One of the important problems in the building of air-conditioned cars is the construction of window sash. The double-glazed sash with the inner-compression seal, made by the O. M. Edwards Co., Inc., Syracuse, N. Y., has been designed to meet the primary requirements of an ideal sash for these cars.

In this sash the two panes of glass, set in metal frames, are spaced about ½ in. apart and are separated by two abutting, compressible, and removable rubber glazing strips. The principal reason for using two panes of glass in a window opening is to reduce the heat transfer, and the overall thermal conductivity for windows of normal size is reduced approximately 50 per cent by the use of double glazing. Previous to air-conditioning, double-glazing was only required during the winter to keep the outside cold air from chilling the inside warm area. With air-conditioned cars it is just as essential to keep the heat of the warm outside air from being transmitted to the interior, which is being cooled.

Another important consideration is the comfort of the passengers. In a coach with an inside temperature of 70 deg. F. and an outside temperature of 10 deg. F., the inside surface of a single-glazed sash would be 42 deg. F. with zero wind velocity, 22 deg. F. when the wind velocity is 30 m. p. h., and 19 deg. F. when the wind velocity is 60 m. p. h. It may readily be seen that a passenger sitting next to a single-glazed sash under such conditions would be very uncomfortable. In the same coach equipped with double-glazed sash and with an inside temperature of 70 deg. F. and an outside temperature of 10 deg. F., the inside surface of the inside pane would be 53 deg. F. with a zero wind velocity, 43 deg. F. when the wind velocity is 30 m. p. h., and 42 deg. F. with a wind velocity of 60 m. p. h. From the above comparison it is obvious that double glazing not only reduces heat transfer but is essential for maximum passenger comfort.

The inner sash of the Edwards double-glazed sash is compressed to the outer by a succession of ingenious, quarter-turn, spring-actuated "compressionizers" spaced around the sash, which maintain and equalize the pressure seal, thus creating the Edwards inner-compression seal. The amount of pressure provided by these compressionizers can be varied so that if each of ten of these devices exerts a 35-lb. pressure, there is 350 lb. of pressure constantly applied around the edges of the glass area.

This seal is important for insulation purposes and to prevent the infiltration of moist air and dirt particles. The essential job of insulation in the dead-air space between the panes of glass is done by the film of air that lies directly on the inside of the glass, like a skin. The reason for the dead-air space is to avoid disturbance of the air and the breaking of this protective film. The infiltration of the moist air inside the car would cause fogging or frosting of the glass. The fogging generally occurs during the colder months of the year; if the glass is cold enough the moisture forms frost.

The variation in the thickness of glass allowed by the Bureau of Standards is plus or minus 1/32 in. To take up this variation a compressible seal must be used, and the best resilient sealing material at the present time is rubber. Rubber, however, allows the passage of water vapor through it, and with varying water-vapor pressure in the atmosphere, there will be a passage of moisture through the rubber to or from the dead-air space. In the Edwards sash, de-hydrating tubes, located within the dead-air space and independent of the sash structure, absorb this moisture and prevent fogging.

The inner sash of the Edwards double-glazed sash is suspended by hinges of the floating-pivot type which take the major portion of the weight when the window is opened, and the sash is easily opened by making a quarter-turn of the "compressionizers" with a screwdriver. This mounting facilitates the cleaning of the inside glass surface. Glass develops an oxide coating in time on its surface. This is called "scum" by the glass manufacturers and, if not cleaned off, it will eventually stain the glass so that it can only be removed by polishing. This condition occurs with silicon glass but not with the more expensive potash glass.

Provision has been made in the design of the Edwards double-glazed sash to insure its application to the car body in a true plane to prevent the transmission of vibration and weaving of the car to the sash, and to make certain of the seal between the sash frame and the car structure. This feature of the design may be altered in minor details to conform to varied car construction. The design is also suitable for meeting all requirements of designers for decorative effect.

The Edwards double-glazed sash is easily opened for the cleaning of the inside glass surfaces

1939 Machine Tool Show

THOSE executives and supervisors of the railroad industry who are responsible for the selection and purchase of machine tools and shop equipment are going to have the opportunity to look over the most extensive exhibit of modern shop tools and related accessories which has ever been assembled in any exposition in this country when they attend the 1939 Machine Tool Show at Cleveland Public Auditorium, October 4 to 13. This year's display will embrace the exhibits of over 200 manufacturers and will occupy 153,000 square feet of floor space —25 per cent more than that covered by the 1935 show.

The 1935 Show was well attended by railroad men, 62 roads having sent representatives to Cleveland. There is every reason for the attendance to be considerably greater at this year's Show for the reason that the machine tool industry is passing through one of the busiest periods in its history and the results of the intensive development work which has been done since 1935 are to be on display at Cleveland in October. Then too, over 60 per cent of the 200 companies exhibiting are manufacturers well known to railroad men.

One of the features of unusual interest will be the technical sessions of the Machine Tool Congress. At the several sessions, on seven evenings, many papers will be presented by men of prominence in industry that will provide an opportunity to get first-hand information on modern machine tools and their use. The program of these meetings appears on this page.

Program of the Machine Tool Congress

WEDNESDAY EVENING, OCTOBER 4

8:00 p. m.—National Electric Manufacturers Association, Hotel Cleveland Ball Room.

THURSDAY EVENING, OCTOBER 5

8:00 p. m.—American Society of Mechanical Engineers, Machine Shop Practice Division, Hotel Cleveland Ball Room.
Presiding Officer: A. G. Christie, Professor, Johns Hopkins University; president, A. S. M. E.
Cast Iron for Machine Tool Frames, by Frank Dost, Sterling Foundry Company, Wellington, Ohio.
Welded Frames for Machine Tools, by Fred Volz, Lakeside Bridge & Steel Company, Milwaukee, Wis.

8:00 p. m.—American Society of Tool Engineers, Inc., Cleveland Engineering Society quarters, Guildhall.
Presiding Officer: G. J. Hawkey, chairman, Cleveland Chapter, A. S. T. E.
Application and Use of Anti-Friction Bearings as Applied to Machine Tools, by Stanley R. Thomas, chief engineer, Bantam Bearings Corporation, South Bend, Ind.
Application and Use of Plain Bearings as Applied to Machine Tools, by Eugene Bouton, supervisor time study, J. I. Case Tractor Works, Racine, Wis.
Bearings—Their Use and Misuse, by Karl L. Hermann, engineer, South Bend, Ind.

7:30 to 10:00 p. m.—General Electric Institute open house program and lighting demonstration, Nela Park.

FRIDAY EVENING, OCTOBER 6

6:30 p. m.—American Society of Tool Engineers, Inc., dinner meeting, Hotel Statler Ball Room.
Presiding Officer: James R. Weaver, president, A. S. T. E.
Second report of Fact Finding Committee on Effect of the Development of the Machine on Employment and Our Standard of Living, by John R. Younger, professor, Department of Industrial Engineering, Ohio State University; chairman, Fact Finding Committee.
Economic and Political Effect of the Development of the Machine, by Hon. Hamilton Fish, United States Congressman from New York.

8:00 p. m.—National Association of Foremen, Music Hall, Cleveland Public Auditorium.
Presiding Officer: C. R. Hook, president, American Rolling Mill Company.
Streamlined Supervision, by Capt. A. A. Nichoson, personnel director, The Texas Company, New York.
A. C. Horrocks, Goodyear Tire & Rubber Company, Akron Ohio; and Executive Vice-President, N. A. F.

MONDAY EVENING, OCTOBER 9

6:30 p. m.—American Foundrymen's Association, Inc., dinner meeting, Hotel Hollenden Ball Room.
Presiding Officer: F. F. Hess, metallurgical engineer, Ohio Injector Company and president, Cleveland Chapter.

8:00 p. m.—Symposium on Castings, Hotel Hollenden Ball Room.
Dr. H. A. Schwartz, National Malleable & Steel Castings Company, Cleveland, Ohio;
James Thompson, chief engineer, Continental Roll & Steel Foundry Company, East Chicago, Ind.; chairman, Foundry Practice Committee, A. S. M. E.;
A. C. Denison, president, Fulton Foundry & Machine Company, Cleveland, Ohio; chairman, Research Committee, Meehanite Research Institute.

6:30 p. m.—Associated Machine Tool Dealers of America, dinner meeting, Hotel Cleveland Ball Room.

TUESDAY EVENING, OCTOBER 10

8:00 p. m.—Cleveland Engineering Society, Machine Design Division, Music Hall, Cleveland Public Auditorium.

WEDNESDAY EVENING, OCTOBER 11

6:30 p. m.—Society of Automotive Engineers, Inc., dinner meeting, Hotel Cleveland Ball Room.
Presiding Officer: W. J. Davidson, president, S. A. E.; sales manager, Diesel Engine Division, General Motors Corp.
A Trip Through the Machine Tool Show, by Joseph B. Geschelin, Detroit Editor, Automotive Industries.
Machine Tools in Modern Industry, by F. E. Crawford, president, Thompson Products Company; president, Cleveland Chamber of Commerce.

THURSDAY EVENING, OCTOBER 12

6:30 p. m.—General Electric Institute dinner meeting and lighting demonstration, Nela Park.

Railway Fuel and Traveling Engineers' Association

Hotel Sherman, Chicago

Tuesday, October 17

Morning Session

10:00 o'clock

Address by L. W. Baldwin, chief executive officer, Missouri Pacific Lines, on Training and Coaching Supervision.
(Opening ceremonies will be attended by combined memberships of the Railway Fuel and Traveling Engineers' Association, the Locomotive Maintenance Officers' Association (formerly the International Railway General Foremen's Association), the Car Department Officers' Association, and the Master Boiler Makers' Association, under the chairmanship of F. P. Roesch, vice-president, Standard Stoker Company.)

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11:00 o'clock

Address by John R. Jackson, President.

Appointment of special committees.

What Can Each Member Do To Promote the Effectiveness of the Railway Fuel and Traveling Engineers' Association, by E. L. Woodward, western editor, ***Railway Mechanical Engineer***

Afternoon Session

2:00 o'clock

Air Brakes—Chairman, W. H. Davies, superintendent air brakes, Wabash.
Sub-committee on Freight Brakes—Chairman, W. E. Vergan, supervisor air brakes, Missouri-Kansas-Texas.
Sub-committee on Handling of the Engineer's Brake Valve on Passenger Trains—Chairman, J. A. Burke, supervisor air brakes, Atchison, Topeka & Santa Fe.

Stationary Boiler Plants—Various fuel-burning appliances as they affect fuel economy—Chairman, R. S. Twogood, fuel engineer, Southern Pacific.

Wednesday, October 18—Mechanical Day

Morning Session

9:30 o'clock

New Locomotive Economy Devices—Chairman, A. G. Hoppe, assistant mechanical engineer, Chicago, Milwaukee, St. Paul & Pacific.

Address by Lee Robinson, superintendent equipment, Illinois Central.

Address—A Few More Avoidable Factors in Design Affecting Fuel and Locomotive Performance, by F. P. Roesch, vice-president, The Standard Stoker Co.

Grates—Chairman, M. F. Brown, fuel supervisor, Northern Pacific.

Steam Turbine and Steam Condensing Locomotives—Chairman, L. P. Michael, chief mechanical engineer, Chicago & North Western.

Afternoon Session

2:00 o'clock

Utilization of Locomotives—Chairman, A. A. Raymond, superintendent fuel and locomotive performance, New York Central.

Locomotive Firing Practice—Oil—Chairman, R. S. Twogood, fuel engineer, Southern Pacific.

Locomotive Firing Practice—Coal, especially dealing with honeycomb—Chairman, W. C. Shove, general road foreman engines, New York, New Haven & Hartford.

Thursday, October 19—Fuel Day

Morning Session

9:00 o'clock

Fuel Wastes and Losses, by J. G. Crawford, fuel engineer, Chicago, Burlington & Quincy.

Fuel Records and Statistics—Chairman, E. E. Ramey, fuel engineer, Baltimore & Ohio.

Address—Fuel Economy from the Viewpoint of the Divisional Superintendent, by W. A. Hurley, assistant general superintendent, New York, New Haven & Hartford.

Address by George J. Leahy, National Coal Association, and Republic Coal and Coke Company.

Coal—Preparation washed and dried coals; inspection, utilization—Chairman, S. A. Dickson, supervisor fuel, Alton.

Routine business and election of officers.

Master Boiler Makers' Association

Hotel Sherman, Chicago

Tuesday, October 17

Morning Session

8:30 o'clock Registration*

10:00 o'clock Address by L. W. Baldwin, chief executive officer, Missouri Pacific Lines, on Training and Coaching Supervision.

(Opening ceremonies will be attended by combined memberships of the Master Boiler Makers' Association, the Railway Fuel and Traveling Engineers' Association, the Car Department Officers' Association, and the Locomotive Maintenance Officers' Association [formerly the International Railway General Foremen's Association], under chairmanship of F. P. Roesch, vice-president, Standard Stoker Company.)

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11:00 o'clock Meeting called to order.
Address by President William N. Moore.

11:30 o'clock **Topic No. 9.** Report on Topics for 1940—Chairman, Myron C. France, general boiler foreman, Chicago, St. Paul, Minneapolis & Omaha.
Business.

Afternoon Session

1:30 o'clock Address by Roy V. Wright, editor, ***Railway Mechanical Engineer.***

Topic No. 4. (Continued from 1938—committee report and individual papers)—Problems created by chemical treatment of locomotive feedwater—Chairman, C. W. Buffington, general master boiler maker, Chesapeake & Ohio.

The Causes and Prevention of Embrittlement in Locomotive Boilers—A lecture with motion pictures, by Dr. W. C. Schroeder, senior chemical engineer, United States Department of Interior, Bureau of Mines.

Report of Special Committee appointed at 1938 meeting.
Routine business.

Wednesday, October 18

Morning Session

9:30 o'clock Routine business.

9:40 o'clock Address by D. S. Ellis, chief mechanical officer, Chesapeake & Ohio.

10:10 o'clock **Topic No. 1.** Training apprentices to be better mechanics—Chairman, A. T. Hunter, assistant general boiler inspector, Atchison, Topeka & Santa Fe.

Apprenticeship—A paper by M. M. Hanson, principal field representative Industrial Commission, Madison, Wis.

Report of the Executive Committee—Chairman, Carl A. Harper, general boiler inspector, Cleveland, Cincinnati, Chicago & St. Louis.
Report of Secretary-Treasurer Albert F. Stiglmeier.
Routine business.

Afternoon Session

1:30 o'clock Address by F. K. Mitchell, assistant superintendent of equipment, Cleveland, Cincinnati, Chicago & St. Louis.

2:00 o'clock **Topic No. 3.** (Continued from 1938)—Improving circulation in the locomotive boiler—Chairman, Carl A. Harper, general boiler inspector, C. C. C. & St. L.
Motion pictures of circulation of water in boiler.

4:30 o'clock **Topic No. 5.** Marking water level and highest point of crown sheet on the boiler head—Chairman, E. H. Gilley, general boiler foreman, Grand Trunk.
Routine business.

Thursday, October 19

Morning Session

9:30 o'clock Routine business.

9:40 o'clock Address by J. M. Hall, chief Bureau of Locomotive Inspection, Interstate Commerce Commission.

10:10 o'clock **Topic No. 2.** Welded alloy-steel tender tanks—Chairman, Leonard C. Ruber, superintendent boiler department, Baldwin Locomotive Works.

Morning Session

11:00 o'clock **Topic No. 6.** Longitudinal cracking of flues in service—Chairman, E. E. Owens, general boiler inspector, Union Pacific.

Afternoon Session

1:30 o'clock Routine business.

1:40 o'clock **Topic No. 7.** Standardizing the inspection, testing and cleaning of locomotive air reservoirs—Chairman, L. R. Haase, district boiler inspector, Baltimore & Ohio.

2:40 o'clock **Topic No. 8.** Renewing fireboxes—Laying out, fabrication, and application—Chairman, F. A. Longo, welding and boiler supervisor, Southern Pacific.

Election of officers.
Closing business.
Adjournment.

*Beginning Monday, October 16, 4:30 p. m. to 6:00 p. m., and each day following starting at 8:30 a. m.

Car Department Officers' Association

Hotel Sherman, Chicago

Tuesday, October 17

Morning Session

9:00 o'clock Registration.

10:00 o'clock Address by L. W. Baldwin, chief executive officer, Missouri Pacific Lines, on Training and Coaching Supervision.

(Opening ceremonies will be attended by combined memberships of the Car Department Officers' Association, the Master Boiler Makers' Association, the Railway Fuel and Traveling Engineers' Association, and the Locomotive Maintenance Officers' Association [formerly the International Railway General Foremen's Association], under the chairmanship of F. P. Roesch, vice-president, Standard Stoker Company.)

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11:00 o'clock Meeting called to order.

11:05 o'clock Approval of minutes of last annual meeting.

11:15 o'clock Address by President C. J. Nelson.

Afternoon Session

1:30 o'clock Address by D. J. Sheehan, superintendent motive power, Chicago & Eastern Illinois.

2:30 o'clock Report of Membership Committee—Chairman J. S. Acworth, supervisor of equipment, General American Transportation Corporation.

3:00 o'clock Report of Secretary-Treasurer F. L. Kartheiser.

3:30 o'clock Unfinished business.

3:45 o'clock New business.

4:00 o'clock Address by E. L. Woodward, western editor, *Railway Mechanical Engineer* and chairman of Publicity Committee.

Wednesday, October 18

Morning Session

9:00 o'clock Freight and Passenger-Car Construction—Chairman, J. McMullen, superintendent car department, Erie.

10:00 o'clock Address by C. H. Dietrich, executive vice-chairman, Freight Claim Division, Association of American Railroads.

10:30 o'clock Shop Operation, Facilities and Tools—Chairman, J. A. Deppe, superintendent car department, Chicago, Milwaukee, St. Paul & Pacific.

11:15 o'clock Passenger-Train Car Terminal Handling—Chairman, G. R. Andersen, district master car builder, Chicago & North Western.

Afternoon Session

1:30 o'clock Lubricants and Lubrication—Chairman, J. R. Brooks, supervisor Lubrication and supplies, Chesapeake & Ohio.

2:00 o'clock Freight-Car Inspection and Preparation for Commodity Loading—Chairman, F. G. Moody, master car builder, Northern Pacific.

3:00 o'clock Interchange—Chairman, M. E. Fitzgerald, master car builder, Chicago & Eastern Illinois.

4:00 o'clock Loading Rules—Chairman, H. H. Golden, supervisor A. A. R. Interchange and Accounting, Louisville & Nashville.

Thursday, October 19

Morning Session

9:00 o'clock Address by Leroy Kramer, vice-president, General American Transportation Corporation.

10:00 o'clock Billing for Car Repairs—Chairman, D. E. Bell, A. A. R. instructor, Canadian National Railways.

11:00 o'clock Painting—Chairman, L. B. Jenson, passenger shop superintendent, Chicago, Milwaukee, St. Paul & Pacific.

Afternoon Session

1:30 o'clock Nominating Committee—Chairman, J. E. Keegan, chief car inspector, Pennsylvania.

Election of officers.

Suggestions for good of the association.

Adjournment.

Locomotive Maintenance Officers' Association*

Hotel Sherman, Chicago

Tuesday, October 17

Morning Session

8:00 to 10:00 o'clock Registration.

10:00 o'clock Address by L. W. Baldwin, chief executive officer, Missouri Pacific Lines, on Training and Coaching Supervision.
(Opening ceremonies will be attended by combined memberships of the Locomotive Maintenance Officers' Association, the Car Department Officers' Association, the Master Boiler Makers' Association, and the Railway Fuel and Traveling Engineers' Association, under the chairmanship of F. P. Roesch, vice-president, Standard Stoker Company.)

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Afternoon Session

2:00 o'clock Report of President F. B. Downey outlining scope and purpose of Locomotive Maintenance Officers' Association.
Report of Secretary-Treasurer F. T. James on past record of old association and status of new association.

2:30 o'clock Proper Maintenance of Modern Locomotives—Address by D. S. Ellis, chief mechanical officer, Chesapeake & Ohio.

4:00 o'clock Roundhouse Problems Caused by Long Runs, by F. J. Fahey, master mechanic, New York Central.

Wednesday, October 18

Morning Session

9:00 o'clock Training of Apprentices—Address by A. H. Williams, general supervisor of apprentice training, Canadian National Railways.

10:30 o'clock Forging and Heat Treating Locomotive Parts, by L. B. Herfurth, forging supervisor, Missouri Pacific.

Afternoon Session

2:00 o'clock Failures of Locomotive Parts and How To Prevent Them—Address by F. H. Williams, assistant test engineer, Canadian National Railways.

3:30 o'clock Scheduling of Locomotives Through Shops for Classified Repairs, by F. B. Downey, assistant shop superintendent, Chesapeake & Ohio.

Thursday, October 19

Morning Session

9:00 o'clock What I Expect of My Supervisors and Why—Address by F. E. Lyford, trustee, New York, Ontario & Western.

10:30 o'clock Best Methods of Selecting Machinery and Tools for Repairs to Modern Locomotives, by R. P. Dollard, shop engineer, Chesapeake & Ohio.

Afternoon Session

2:00 o'clock Address by Lewis B. Rhodes, president, Allied Railway Supply Association.

3:30 o'clock Election of officers.

*Formerly the International Railway General Foremen's Association.

EDITORIALS

The October Conventions

The final programs of the four conventions to be held at Chicago during the third week in October, which are printed in this issue, all promise meetings which will be well worth the attendance of those engaged in the respective branches of mechanical-department work. Not only is this suggested by the names of the speakers who will bring messages of challenge and inspiration to those fortunate enough to attend the meetings, but it is even more evident in the character of the working programs that deal with the problems which the various groups of supervisors have to meet in their every-day work throughout the year. Every one of these groups —the Master Boiler Makers' Association, the Car Department Officers' Association, the Railway Fuel and Traveling Engineers' Association, and the new Locomotive Maintenance Officers' Association—should be largely attended.

The new Locomotive Maintenance Officers' Association, which is evolving from the old International Railway General Foremen's Association, has an excellent program with which to start its new career. A good attendance at this year's meeting is especially desirable because it will provide the material from which to set up an effective working organization for the future.

With this in mind it is particularly deserving of support. The fact that particular attention has been called to it, however, does not imply that the other associations which are more firmly established should not be equally well supported. The work of each of these is well known, however. They have earned support and undoubtedly will receive it again.

France Takes The Lead

Those who read Lawford Fry's two-part review of André Chapelon's book, "La Locomotive a Vapeur," which appeared in the December, 1938, and January, 1939, issues of the *Railway Mechanical Engineer,* will look with particular interest for the article by the same author on another page of this issue, entitled "French Tests Show High Locomotive Efficiencies." In this article, which deals with the performance obtained from the locomotive rebuilt in accordance with the principles set forth by Mr. Chapelon, Mr. Fry has translated into English terms the dimensions and performance of the Paris-Orleans-Midi rebuilt 4-8-0 locomotive and has analyzed the results so that they may be compared with familiar American performance.

For many years American motive-power men have been inclined to think that in the matter of scientific development of the steam locomotive we led the world. In recent years, however, it is evident that for truly scientific developments of the steam locomotive France has stepped well out ahead of the rest of the world.

The rebuilt French locomotive with which Mr. Fry's article deals has a total engine weight of 240,000 lb. and develops a maximum indicated horsepower of approximately 3,700—an indicated horsepower for each 65 lb. of total engine weight. This locomotive has a combined evaporative and superheater heating surface of 3,022 sq. ft., thus developing an indicated horsepower for each 0.82 sq. ft. of heating surface. The New York Central J3 class 4-6-4 type locomotive is the best American design for which performance data are available. This locomotive has a total engine weight of 360,000 lb. It has developed a maximum of 4,700 i. hp.—one horsepower for about 77 lb. of engine weight. It has a combined evaporative and superheater heating surface of 5,932 sq. ft., thus developing a horsepower for each 1.26 sq. ft. of combined heating surface.

The outstanding performance of the French locomotive is not the result of any striking departures from the well-established basic features of steam locomotive anatomy; it is evidence of the importance of the careful study and proportioning of details, particularly those affecting the use of steam, some which have apparently never given the American designer serious concern.

The steam locomotive is being subjected by the Diesel-electric locomotive to the most serious challenge for its place on the railways which it has ever had to face in its entire history. Its strongest competitive advantage is its relatively low first cost which makes the question of a low weight-power ratio a particularly important one. Furthermore, the high thermal efficiency implied by the high horsepower output of the French locomotive is also becoming of increasing importance as the competition of motive-power types continues to develop. The same painstaking attention to detail improvements that is evident in the recent French developments is much needed at the present time in the development of the steam locomotive in America.

Modern Passenger Cars

Beginning in 1930 with the advent of air conditioning, a remarkable evolution has been taking place in the railway passenger car. Air conditioning, which, up to July 1, has been applied to over 11,000 railroad-owned and Pullman cars, according to reports received by the Association of American Railroads, is an old story. So

also are some of the other improvements which are now accepted as established features of the modern passenger coach. Setting them down so that one may see them all at once, however, leaves one definitely with the impression that the evolution of the passenger car which began nine years ago has accelerated rapidly into little less than a revolution during the last half of that period. This applies not alone to features affecting the comfort and attractiveness of the cars, but to the structure as well.

Ideas as to passenger-car construction and weight have been greatly changed by three new types of structural material and the new techniques of fabrication which are being employed with them. More and more evidence of the acceptance of the light-weight designs thus made possible is appearing every day. All this has taken place in the past five years.

The improvements and refinements affecting the attractiveness and comfort of railway passenger travel are many and varied. The replacement of the walk-over type seats, first with the automotive "bucket" type and then with the rotating-reclining type which permit shaping seats for comfort, is a major improvement in itself. It has been supplemented by the advent of sponge-rubber cushions which are sanitary and an aid in the making of comfortable seats.

One of the striking improvements in the modern passenger coach is in the toilet and lounge facilities, both of which, in appointments as well as in spaciousness, are comparable with those long enjoyed by the Pullman patron.

The new era of interior design and decoration, made possible by the cleanliness resulting from pressure ventilation, is wielding a tremendous influence in renewing the interest of the American public in railway travel. Few new passenger-carrying cars are turned out today in the interior design of which competent talent in the interior decorator's art is not consulted. Violations of good taste and the creation of depressing effects are thus being avoided.

Probably no feature of the passenger car affecting the comfort and pleasure of the traveler is receiving more intensive study than car lighting. This has three objectives: First, to affect an increase in lighting intensity and improvement in distribution neither of which has been up to the physiological requirements for the avoidance of eye strain; second, the attainment of higher efficiency in the production of the light and in its utilization, and, third, making the lighting an attractive and harmonious feature of the decorator's scheme for the interior treatment of the car. As fast as new types of lamps are brought out, they are being adapted for use in car lighting, and the new plastics are being utilized in numerous ways for the control of light distribution and for achieving striking and beautiful decorative lighting effects.

The sliding-sash type of coach window was long a source of annoyance to passengers because it so frequently could not be opened and, when closed, was the source of annoyance because of the infiltration of dirt and, in the winter time, of streams of unpleasantly cold air. Air conditioning has removed the necessity of opening windows, and, by dehydration, the modern double-sash window, which tightly seals the opening into the car, can be kept free of steam and frost. Clear plate glass also improves the pleasure of railway travel.

Definite improvements are being made in the riding comfort of passenger cars. This applies to truck suspensions and draft gears in the design of both of which the importance of low rates of acceleration in the movements which they are designed to control is beginning to receive recognition. In this connection, sound insulation should also be mentioned. The reduction in the transmission of high frequently vibrations, both within and without the sound range, adds greatly to travel comfort and reduces a source of nervous irritation.

Reductions of weight amounting to one-third or more constitute a strong economic factor in favor of the gradual retirement of old passenger equipment and its replacement with new cars of completely modern construction. The amount of the investment involved, however, calls for a program covering an extended period. With the possible exception of the improvement in trucks, all of the changes affecting the comfort and attractiveness of passenger travel can be installed in existing cars. It is unnecessary, therefore, to limit the rate at which the benefits of improved passenger appeal can be made effective to the rate at which the old cars can be replaced with new ones, completely modern.

Most roads are wisely giving consideration to such modernization of existing passenger cars. These programs of rehabilitation start with the cars for the best trains and gradually include equipment for all main-line service. When they have been completed, however, an end will not yet have been reached. Cars for local service, and even those for commuter travel, should then be added to the program. Only in this way can the railroads take full advantage of the possibilities of the features of the modern passenger car for building up favorable public interest. Indeed, to stop short of a complete job will tend to create a positively unfavorable reaction, the ultimate effect of which will reach far beyond the local service in which it arises.

Are Good Mechanics Needed Any More?

Along about 1930, when things in industry really began to go bad in a big way, there came forth numerous individuals and groups who offered all kinds of explanations as to why things were going wrong and were just as prolific in their offerings of solutions to effect quick changes and restore prosperity. The fact that most of the explanations failed to explain and most of the solutions turned out to be just crazy ideas does not alter the fact that in 1930 were born many of the ideas that have since proved responsible for the position that American industry is in today. It is only human nature for some people to dissipate most of their energies in looking for someone on whom to blame things rather than to search

for an intelligent, long-time solution to their problem.

What we are leading up to is a consideration of the statement that has been dinned into our ears for almost 10 years to the effect that the development of the modern machine has proceeded at such a rapid pace that the men who have been displaced by the enormous increases in the productive capacity of machine tools cannot be absorbed by industry for other kind of work. Add to this, then, the belief of many, under such conditions, that industry has bent all its efforts to the development of the machine and has paid little or no attention to the development of the man who runs it. Stated in other words these people believe that since the brains and skill have been built into the machine any mediocre operator can get all that is necessary out of it. The fallacy of this belief is evident on every hand today and there is not an industry, from the builder of the tools to the ultimate user, that is not seriously handicapped by the lack of thoroughly trained mechanics and machine operators.

In the railroad industry few men have been hired within the past 10 years to reinforce the ranks of skilled workmen. Our apprentice training systems were practically abandoned at the beginning of the depression, thereby effectively stopping the inflow of new blood into the mechanical departments of our railroads. The necessary reduction of forces due to the curtailment of operations took its toll not only of the workmen who entered service 20 years ago but started to cut seriously into the ranks of the still older men who were approaching retirement age. So, today the industry stands at the threshold of a period in which skilled mechanical workmen are quite surely to be in the greatest demand and is in the vulnerable position of having its supply of such talent at the lowest point in years.

This is a machine age and the productive capacity of the modern machine tool has been greatly increased due to the strides that have been made in the development of new materials out of which to build a more rugged machine; in the development of modern tool steels that will stand up under the gruelling punishment of feeds and speeds that were undreamed of a few years ago; in the ingenious designs that have been worked out for tooling arrangements that permit moving from operation to operation with intervals of seconds where minutes formerly were necessary and, finally, the designers of electrical and hydraulic controls and mechanisms have tied all of these improvements together in such a manner that a single operator can command their many functions with the greatest of ease. These are the things that have made it possible for a single workman to remove more metal or finish more parts in an eight-hour day today than could have been done in a week a few years ago.

Regardless of the fact that the railroads do not buy nearly as many locomotives and cars as they formerly did no one will deny that remarkable progress has been made in the development of the locomotive. In fact, when one considers the transportation capacity of the modern steam and Diesel locomotive the railroad industry may take a certain amount of pride in the fact that it has kept pace with other industries in this respect. It is also a fact that as far as the engineman is concerned it is necessary for him to possess a much broader mechanical knowledge to hold down his job today than was demanded of his predecessor of 20 years ago. Such a parallel may be found in the shop and the only reason that its importance has not been greatly emphasized is that the installation of modern shop tools and equipment has not kept pace with the installation of modern motive power.

The railroads must have modern tools in order to cut the cost of production as well as to provide reserve production capacity in the face of a diminishing supply of skilled labor. They must also very soon begin to give serious thought to the problem of bringing in and training the kind of men who will have the mechanical knowledge necessary to get out of the modern machine tool the productive capacity that the tool builder put into it. One glance at some of the new tools that will take their place in the industrial production line next year should convince anyone that not only are good mechanics still needed but that they are going to have to be of a different type than mechanics of 20 years ago.

What are the railroads going to do—stand by until the emergency is upon them and it is too late to fill the gaps, or, plan an intelligent program of building shop organizations with the men that will be needed five and ten years from now?

New Books

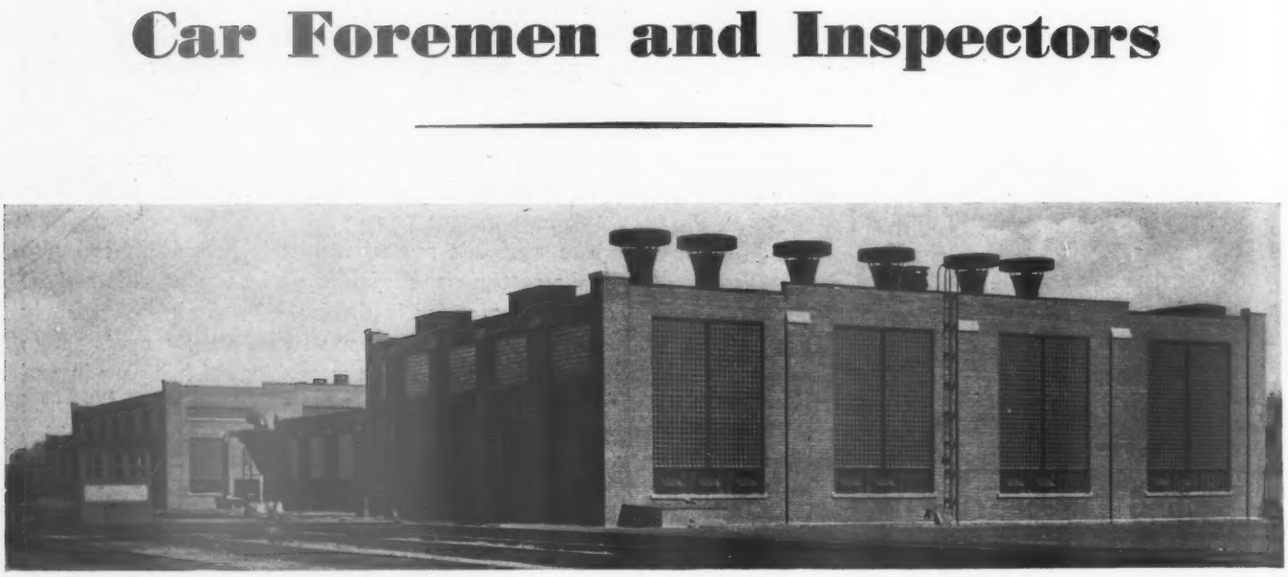
THE LOCOMOTIVE RUNNING DEPARTMENT. *By John G. B. Sams. Published by The Locomotive Publishing Co., Ltd., 3 Amen Corner, E. C. 4, London, England. 104 pages, illustrated. Price, $1.*

The seven chapters of this book on English practice cover engine-terminals; mechanical and other appliances used about the terminal; locomotive operation; storekeeping; locomotive failures and routine inspections; train operation; road failures, and train operation. The book has been written especially for students and others interested in locomotive operation.

LUBRICANTS AND LUBRICATION. *By James I. Clower, B.S., M.E., associate professor of machine design at the Virginia Polytechnic Institute. Published by the McGraw-Hill Book Company, Inc., New York. 464 pages, illustrated. Price, $5.*

The first eleven chapters of this book are devoted to the fundamentals of lubricants and lubrication. The author discusses fully the source, production, and refining of lubricants, and the theory of lubrication. The next six chapters cover in detail the lubrication of steam turbines, steam engines, air compressors, refrigerating machines, and all types of internal combustion engines. The general principles and practices as set forth in the first eleven chapters are applied to specific machines. The last chapter points out the principles and proper practices for the storing and handling of lubricants.

With the Car Foremen and Inspectors



New C. & E. I. coach shop has glass-block walls and Binks paint-spray exhaust equipment

C. & E. I. Builds

New Danville Coach Shop

Steel, brick and glass-block structure is provided with modern equipment throughout for maintaining system passenger-train equipment

THE Chicago & Eastern Illinois now has in operation at Danville, Ill., a thoroughly modern coach shop, recently completed at a cost of $250,000, and built to replace the old shop which was destroyed by fire on November 22, 1937. The extensive use of glass-block construction in the side walls and the provision of complete spray-painting facilities throughout are features of the new shop. The C. & E. I. equipment which will be overhauled and rebuilt at this shop includes 48 head-end cars, such as baggage, mail and express and combination cars, 38 passenger cars and 7 dining cars, all of which are of steel construction and air conditioned with the exception of three which will be equipped for air-conditioning during 1939 at the Danville coach shop.

Portable truck-mounted fan and hood used in exhausting air from car interiors

In order to maintain these cars properly, they are shopped on a definite schedule. Dining cars are taken into the shop every 18 months for complete overhauling, repainting and reconditioning. Passenger-carrying cars are shopped every 24 months for complete overhauling and head-end cars every 36 months. The shop is organized and designed for an output of 2½ to 3 cars a month, with a force of 47 men, including 4 supervisors, 16 coach car men, 2 cabinet makers, 1 truck man and helper, 5 painters, 2 upholsterers, 2 electricians, 6 sheet metal workers and 2 helpers, 2 electrician helpers, 1 electric welder and 3 laborers. This force also takes care of a large amount of shop-order work which is quite extensive, especially in the upholstery shop and sheet metal shop, such as the manufacture of locomotive cab curtains and cushions, repairs to office furniture, awnings, arm rests, etc. The man-hours of work on shop orders sometimes exceeds that on car repairs.

Description of the New Shop

As shown in the drawing, the shop building extends in an east-west direction, being adjacent to a transfer table and occupying an area practically 110 ft. wide by 417

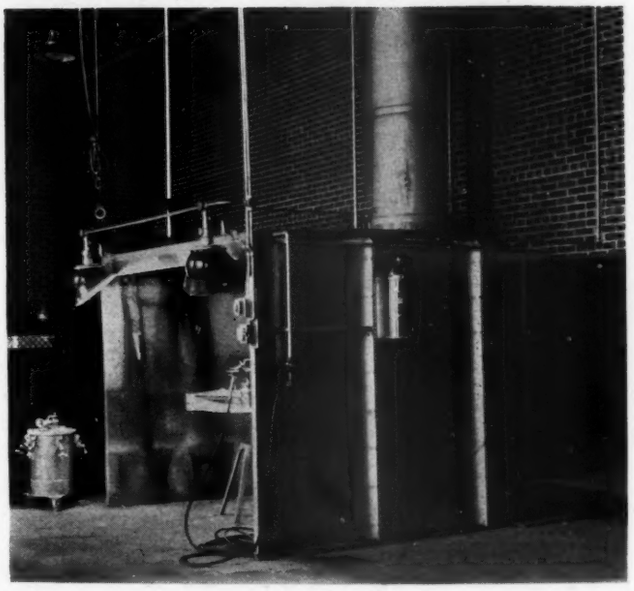
ft. long. The west wing, 90 ft. 10 in. long, is the paint shop, equipped with Tracks 1 to 4, spaced on 19-ft. centers. Next is a 150-ft. section, only 82 ft. wide, devoted to the varnish room, upholstering, pattern and cabinet shops. The coach shop occupies the full width of the building for a length of 126 ft. and includes Tracks 5 to 10 inclusive. The east end of the shop, for a length of 49 ft. 7 in., houses the pipe shop, battery room, tool crib, washroom and toilet.

Referring to the elevation drawing, it will be seen that the paint and coach shops occupy the full height of the building, namely, 30 ft., whereas the other departments, needing less head room, are only 20 ft. high. This contributes to economy in the construction and heating of the building and facilitates getting additional light into the paint and coach shops without going to the familiar saw-tooth type of roof.

The building is constructed of steel and brick with a large proportion of the wall area composed of individual hollow glass blocks about 8 in. square by 4 in. thick, set in cement and arranged in large window groups. These glass blocks are not transparent but admit a high percentage of visible light rays, have a certain insulating value and are largely self-cleaning on the exterior through the action of rain water. The shop is heated with steam by means of unit fan-type heaters, located as required and supplied by the American Blower Company. General illumination for operation of the shops on dark days and at night, when necessary, is supplied by drop-light fixtures with reflectors. The large shop door at each of the ten tracks is a two-part steel and glass door which operates vertically and can be quickly and easily opened or closed by means of an endless chain and pulley arrangement.

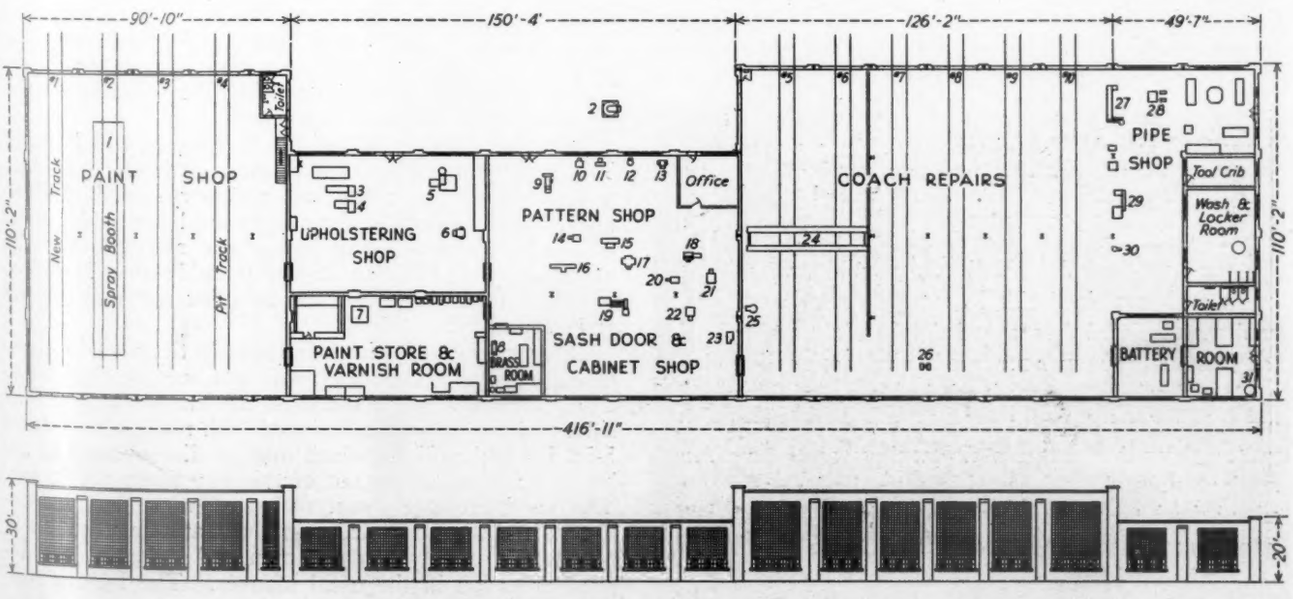
An important feature of this shop is the location of all departments on the ground level which saves both time and labor otherwise required in moving materials to and from the cars. The main shop office is located in one corner of the pattern and cabinet shop at approximately the center of the shop building. A Kirk & Blum shaving exhaust system is installed, with pipe connections to individual woodworking machines and a centrifugal shaving collector nearly opposite the main office door.

The paint shop is equipped with a pit on Track 4 to facilitate inspection and stripping operations and over



Binks spray hood and equipment used in painting car sash, trim and all small parts

Track 2 there is a Binks paint spray exhaust canopy, 90 ft. long, 16 ft. 6 in. wide by 7 ft. 8 in. high, made of No. 20 gage steel, painted with aluminum and divided into six sections to permit single or multiple operation. This canopy is supported by ten 4-ft., 5.4-lb., channels 18 ft. long, spaced on 10 ft. centers, bolted to the bottom chord of the roof trusses and reinforced by sway bracing. The unit consists of one inner canopy and one outer canopy properly suspended to give the correct areas for air distribution and connected to six 42-in. dia. galvanized-iron stacks 12 ft. long with automatic dampers, two clean-out doors and a 42-in. exhaust fan for each stack. The unit has two concrete floor ducts 18 in. by 18 in. by 98 ft. 8 in. long, equipped with one blower having a capacity of 18,300 cu. ft. per min., driven by a 10-hp. explosion-proof, 44-volt, 60-cycle, 3-phase motor. The canopy is lighted by fifty-four 200-watt lamps with 12-in. explosion-proof reflectors.



Floor plan of the new C. & E. I. coach shop

Binks 90-ft. exhaust canopy on Track 2 in the paint shop—Track 4 is the stripping pit

The upholstery shop, immediately adjacent to the paint shop, is 46 ft. by 66 ft. and equipped with two Singer sewing machines, cushion washing and dyeing facilities, and an Atlas 24-in. hair picker. Also located next to the paint shop and separated from it only by a fire wall, is the paint stores and varnish room for spraying smaller pieces, such as sash, seats, furniture and other car trim. This room is 33 ft. by 66 ft. and houses, besides the paint store room in one corner, a small Binks paint-spray cabinet which is used to draw fumes out of the shop while spray painting all small materials. The varnish room is well equipped with sash racks, lift trucks, etc. The pattern and cabinet shop, 80 ft. by 84 ft., includes the shop office in one corner, as stated, and the rest of the space is devoted to the convenient location of 15 woodworking machines of various types and kinds, as shown in the table, which are needed for doing the different classes of work required in this department.

Cushion washing, dyeing and drying facilities

In the coach shop, about 126 ft. long by 110 ft. wide, Track 5 is devoted to truck repairs. It is equipped with a 15-ton traveling crane and necessary small machine tools. Track 6 is used for the removal and replacement of trucks, the cars being jacked one end at a time by means of two Whiting 25-ton portable electric hoists. Tracks 7 to 10 inclusive, are used for car body repairs and rebuilding.

One innovation in the coach shop is the use of adjustable double scaffolds which may not only be elevated to any height desired for the most efficient working on car sides and roofs, but are designed with retractable vertical 5-in. I-beam supports which may be disconnected at the bottom and drawn up out of the way when not in use. The platforms are counterbalanced with scrap superheater-flue sections filled with lead and may be easily pushed up or down by one man and locked at the desired elevation in the usual manner. The I-beam supports, also counterbalanced in the same manner, are de-

signed so that they may be easily raised or lowered. They are guided in the upper channels, which are hung from the roof trusses. With the I-beams locked in the upper position, the coach shop presents a much neater and less congested appearance and, what is even more important, it is easier to work around the cars, especially when applying large material such as side sheets, battery boxes and air-conditioning units.

The relatively large and well-equipped pipe and sheet-metal shop is located conveniently with respect to car maintenance operations and special tools include a 10-ft. bending brake, 36-in. squaring shears, a metal-cutting band saw and a high-speed drill. The 25-ft. by 47-ft. battery room is designed for the efficient rebuilding and charging of batteries, a mono-rail hoist being used in handling the batteries. A 50-gal. still supplies distilled water.

A spacious wash and locker room is located in the east end of the building. This is equipped with large individual lockers, 10-man circular washbasins and three shower baths.

Method of Operation

Passenger cars, received for general repairs at the Danville shops are stripped on Track 4, in the paint shop, the cushions, seats, backs, curtains, chairs, etc., including rugs and paddings, going to the upholstery shop where they are cleaned, renovated and repaired or made new, as required. Sash, doors, diner equipment, sash stops, tables, etc., are removed and placed in the varnish room where they are washed and taken to the sash and cabinet shop for inspection, repair or renewal, as needed. These parts are then returned to the varnish room for refinishing under the small Binks spray hood.

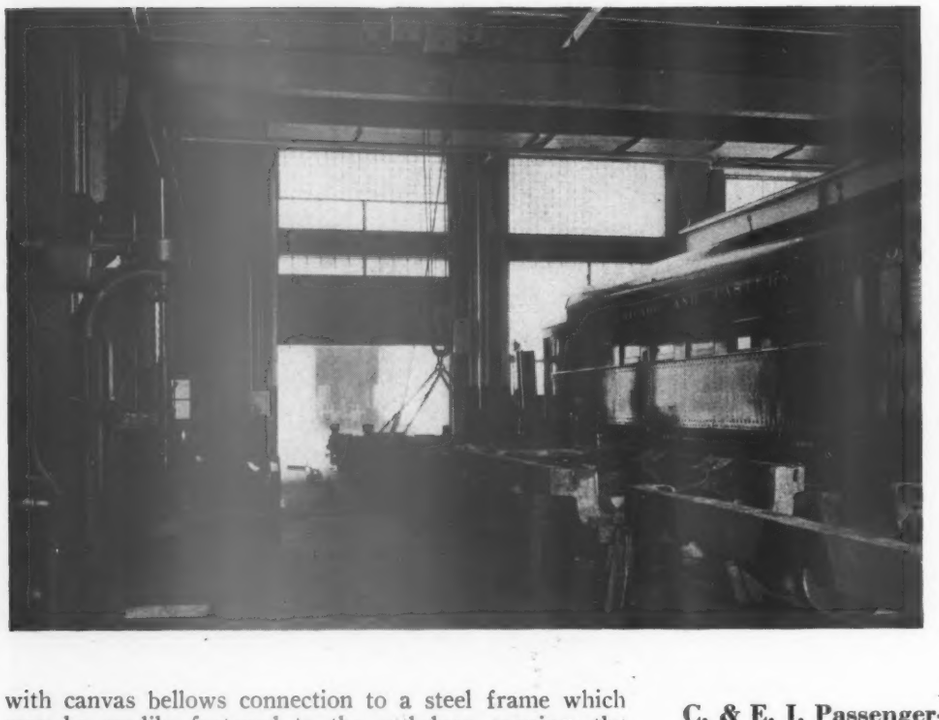
After stripping on Track 4, the car is moved, via the transfer table, to either Tracks 1 or 3, where it is washed and cleaned. It is then being removed to Track 6 in the coach shop where the car is jacked up and the trucks transferred by crane to Track 5 for repairs. The car, mounted on dolly trucks, is then moved to either Track 7, 8, 9, or 10 for all necessary repairs to the body, underframe, roof, vestibule, brakes, air-conditioning equipment and all underneath parts. When repaired, the car is then moved back to Track 6, re-trucked and moved over the transfer table to Track 2 under the Binks spray canopy.

One of the Whiting 25-ton portable hoists used in jacking cars

Here all necessary painting is done quickly, efficiently and safely, as regards both personal health and fire hazards.

In connection with painting, one of the illustrations shows an air exhausting device which is applied to car ends whenever the interiors must be sprayed without removing the sash. Two blower fans, driven from a 1½-hp. electric motor, are mounted in a sheet-metal housing

The pattern shop



Tracks 5 and 6 in the coach shop where trucks are removed and repaired

with canvas bellows connection to a steel frame which may be readily fastened to the end-door opening, the bellows extending across the vestibule. With the door in the opposite end of the car open and these blower fans operating, a sufficient circulation of air is secured in the car interior to make the working conditions satisfactory. Fume-laden air is exhausted upward from the blowers and passes out through the roof of the Binks exhaust canopy. The blower fans, housing, etc., of this device are mounted on a hand truck for easy portability about the shop.

At the completion of painting operations on Track 2, the car goes back to Track 4 for trimming and the installation of auxiliary equipment not previously applied. All air-conditioning apparatus, steam and water equipment, and air brakes are tested and adjusted and the car is then ready to move to the shipping track and be placed in service.

Adjustable double scaffold designed with vertical I-beams which telescope the upper supporting channels

C. & E. I. Passenger-Car Repair Classification

In the classification of passenger-car repairs, the condition of the exterior finish is a basic consideration. On the C. & E. I., Class I repairs consist of complete removal of the exterior finish by sandblasting and refinishing, at a cost of $3,000 to $5,500. Class 2 repairs consist of washing the exterior finish and maintaining the lettering, but otherwise performing a full general repair at almost as much expense as the Class I job. Class 3 repairs consist of refinishing the exterior without removing the old paint or stripping the car, at a cost of $300 to $600. Class 4 repairs constitute any work which holds the car out of service two or three trips at a cost of $100 to $200.

In the case of Class I repairs at Danville shops, the car is sent from Track 4 to the sandblast position east of the shop, where the finish is removed. The work of repainting and refinishing cars requiring Class 2, 3, or 4

Equipment Installed at the New C. & E. I. Coach Shop, Danville, Ill.

1—Binks 90-ft. paint-spray exhaust canopy
2—Kirk & Blum shaving-exhaust system
3—Singer sewing machine for light work
4—Singer No. 7-34 sewing machine for rugs, carpets, etc.
5—Cushion-washing and dying facilities
6—Atlas 24-in. hair picker
7—Binks spray booth (small)
8—U. S. Electric 2-head 4-speed Model 95 burnisher
9—Oliver 20-C wood lathe
10—Driver drill press
11—Yates American J-47 15-in. disc sander
12—Yates American J-45 20-in. oscillating spindle sander
13—Oliver No. 585 variety oilstone tool grinder
14—Yates American Y-20 20-in. bandsaw
15—Yates American No. 1 20-in. hand jointer
16—Yates American G-44 swing cut-off saw
17—Yates American B-44 24-in. planer
18—Yates American G-87 tilting-arbor rip saw
19—Yates American C4-A moulder
20—Yates American U-21 vertical-motor boring machine
21—Fay & Egan No. 50 band saw
22—Fay & Egan No. 379 vertical mortiser
23—Fay & Egan No. 70 tenoner
24—Harnischfeger 15-ton travel-lift crane, floor controlled
25—Hillis-Clark 24-in. upright drill press
26—U. S. electric double tool grinder
27—Chicago 10-ft. bending brake
28—Pexto 36-in. squaring shears
29—Atlantic 36-in. band saw equipped with metal-cutting blade
30—Manning, Maxwell & Moore speed drill
31—Polarstill still, 50 gal. per hour capacity

repairs is all done in the new shop without any outside movement except over the transfer table.

No shop schedule covering detail car parts is used at the new Danville coach shop, owing to the relatively small number of cars which must be handled. The cars are scheduled in the shop, thoroughly inspected, necessary material ordered and the out-of-shop dates set, the various shop department foremen watching this general schedule and completing their work so as to get the cars out on time. The principal advantage of this new coach shop is that it permits turning out a better grade of passenger-car maintenance work at lower unit cost. This is made possible largely by provision of the right kind of tools at the right place and the location of the various shop departments so as to save both time and labor in handling materials. No inconsiderable factor is the improved morale of the men who have not only a safe and comfortable shop in which to work, but benefit from unexcelled locker and washroom facilities, as well as machines and equipment which eliminate most of the heavy manual labor in passenger-car repair operations.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Insufficient Information of Car Damage Subject to Rule 44

On July 30, 1937, Atlanta, Birmingham & Coast flat car No. 9112 was damaged on the Wheeling & Lake Erie at Brewster, Ohio. The W. & L. E. submitted to the A. B. & C. joint inspection and a report of how the damage occurred and asked for disposition of the car under A. A. R. Rule 120. The A. B. & C. declined to make an inspection of the car and would not agree that the owners were responsible. The W. & L. E. stated that the car was damaged in the following manner: The A. B. & C. flat car was standing on track No. 4 behind one car and ahead of eight cars. The conductor, in making up a train, took 19 cars from track No. 5 and coupled them to those on track No. 4 and while pushing this draft of cars toward the rear of the track the A. B. & C. car buckled in the center. No other cars in this draft were damaged, and the W. & L. E. contended that the damage did not occur under any of the provisions of Rule 32. The A. B. & C. contended that the damage was caused by impact switching and came under the provisions of Rule 32. At different dates the W. & L. E. furnished the A. B. & C. with statements of the conductor, the general yardmaster, and the assistant trainmaster who were concerned with the damaged car. These statements differed as to the circumstances under which the damage occurred.

In a decision rendered November 17, 1938, the Arbitration Committee stated: "The evidence furnished by the Wheeling & Lake Erie as to the circumstances under which the damage occurred is conflicting and, therefore, the responsibility of the car owner has not been established under the provisions of Rule 44. The contention of the Atlanta, Birmingham & Coast is sustained."—*Case No. 1765, Wheeling & Lake Erie versus Atlanta, Birmingham & Coast.*

Bill for Repairs Claimed Excessive and Unwarranted

On February 10, 1938, the Southern made repairs to a St. Louis-San Francisco stock car at its Columbia, S. C., shop and rendered bill for $129.34 against the owner. After the repairs were completed the car was moved empty by the Southern to Birmingham, Ala., and delivered to the owner. The S. L.-S. F. took exception to the charge and contended that the repairs were made in violation of A. A. R. Rule 1 and as there was no question involving the safety of the trainmen or lading and the Southern had a direct connection with the home line the car could have been moved to Birmingham with safety and without repairs. The Southern contended that Rule 1 (b) did not contemplate the movement of a car for several hundred miles to effect delivery, and that the delivery of the car home empty had no bearing on the case as neither the mechanical nor the yard forces at Columbia had any assurance that the car would not be loaded after leaving Columbia.

In a decision rendered November 17, 1938, the Arbitration Committee stated: "The Southern Railway having a direct connection with the car owner, the repairs made were in violation of Rule 1 (b) and the bill should be cancelled."—*Case No. 1767, St. Louis-San Francisco versus Southern.*

Repairs of Defects on Car Moving Home for Repairs

The Southern shopped Keith Railway Equipment Company's tank car No. 8116 at Meridian, Miss., on September 8, 1936, for renewal of decayed running boards, and for running-board bolts, sill-step bolts, grab-iron bolts and similar items which were worn and loose, and also for the cleaning of air brakes and the periodical repacking of the journal boxes. The Keith Railway Equipment Company took exception to the charges for these repairs, claiming that the car was being moved to their shops for repairs. This car was received from the Mobile & Ohio for delivery to the Yazoo & Mississippi Valley, for whom the Southern acts as agent and makes repairs to all equipment at Meridian. The Southern contended that when the car was received from the M. & O. it carried no card or other marking indicating that the car was en route home for repairs, and furthermore, the condition of the running boards and the various bolts was such as to be dangerous and a hazard for trainmen and due to the nature of the defects they could not have been temporarily repaired, but required entire removal. The Keith Railway Equipment Company contended that the Southern was not furnished any orders on the above car because the car was not billed over their line, and that the lines over which the car was ordered to move had respected the owner's wishes to make their own repairs as requested by the notation on the way-bill, "Home shop for repairs."

In a decision rendered November 17, 1938, the Arbitration Committee stated: "As agent for the Yazoo & Mississippi Valley the Southern was justified in repairing the defective safety appliances and other defects it considered necessary for the safe movement of the car. The contention of the Keith Railway Equipment Company is not sustained."—*Case No. 1766, Keith Railway Equipment Company versus Southern.*

Air Brake Questions and Answers

D-22-A Passenger Control Valve (Continued)

478—*Q.—What is the purpose of the charging choke?* A.—It controls the rate of flow from the brake pipe to the quick action chamber.

479—*Q.—For what purpose are the chokes in the vent valve cylinder cover?* A.—Control the rate of exhaust of the quick action chamber air during emergency and thus provides the time interval required before release can be affected following an emergency application.

480—*Q.—What communications are open in the service lap position?* A.—Brake pipe to quick-action chamber via charging choke *27*. Brake pipe to vent-valve chamber, accelerated-release check and chamber *F* in release-insuring-valve portion. Auxiliary reservoir to release-insuring-valve portion, and auxiliary-reservoir check. Emergency reservoir to spring side of emergency valve and to outer area of emergency-valve face. Emergency reservoir to chamber above the spill-over check, and chamber over emergency slide-valve-strut diaphragm, emergency reservoir to emergency-reservoir check, and to the chamber over the emergency-reservoir charging check valve. Auxiliary reservoir to the release slide-valve chamber *D*, service slide-valve chamber *C*, release-insuring-valve portion, and to the auxiliary-reservoir check. Displacement reservoir to safety valve and the face of the emergency valve.

481—*Q.—What communications are open in the graduated-release lap position?* A.—The brake pipe to the quick-action chamber via the charging choke *27*. The brake pipe to the vent-valve chamber and chamber *F*, in the release-insuring-valve portion. The auxiliary reservoir to the release-insuring-valve portion and the auxiliary-reservoir check. Emergency reservoir to the emergency-reservoir check and to the chamber over the emergency-reservoir charging check valve. The emergency reservoir to the chamber above the spill-over check and to the chamber over the emergency slide-valve-strut diaphragm. Displacement reservoir to the safety valve, to the spring side and the face of the emergency valve, Chamber *K* on the spring side of the release piston to atmosphere, via of ports in the service slide valve and seat.

482—*Q.—What communications are open in emergency position?* A.—The quick-action chamber to the face of the vent-valve piston *42* and to atmosphere via exhaust *Z*. The brake pipe to atmosphere past the vent-valve seat. The brake pipe to the release-insuring-valve portion, the auxiliary reservoir to the displacement reservoir, to release-insuring-valve portion and auxiliary-reservoir check valve. The emergency reservoir to the displacement reservoir, by way of the emergency valve and to the emergency-reservoir check valve. The emergency reservoir to the face of the emergency valve, to the chamber over the strut diaphragm, to the chamber over the spill-over check valve, to the chamber over the back-flow check and to the chamber over the emergency-reservoir charging check valve. From the spring side of the emergency valve to atmosphere.

483—*Q.—What communications are open in the accelerated release position?* A.—The brake pipe to the quick-action chamber, to the vent-valve chamber and to the release-insuring-valve portion. Combined displacement- and auxiliary-reservoir pressure to brake pipe via accelerated-release check. Displacement reservoir to the safety valve, and to the face of the emergency valve. Emergency reservoir to the spring side of the emergency valve, to the chamber of the spill-over check and strut diaphragm and to the chamber over the emergency-reservoir check valve. Auxiliary reservoir to the chamber over the auxiliary-reservoir check valve and to the release-insuring-valve portion.

484—*Q.—What is the duty of the type B relay valve?* A.—It relays the application and release operation of the control valve, reproducing in the brake cylinder the pressure condition established.

485—*Q.—Where is the condition established?* A.—In the displacement reservoir.

486—*Q.—How does the relay valve provide for a combination of number and sizes of brake cylinders?* A.—It has a high capacity for air flow, which provides fast application and release rates for any combination of cylinders.

487—*Q.—What does the relay valve consist of?* A.—It consists of a body mounted on a pipe bracket. Mounting brackets are reversible, permitting either suspension or floor mounting of the valve.

488—*Q.—Name the operating parts of the relay valve.* A.—The relay-valve piston, the application piston, the exhaust valve and the exhaust piston.

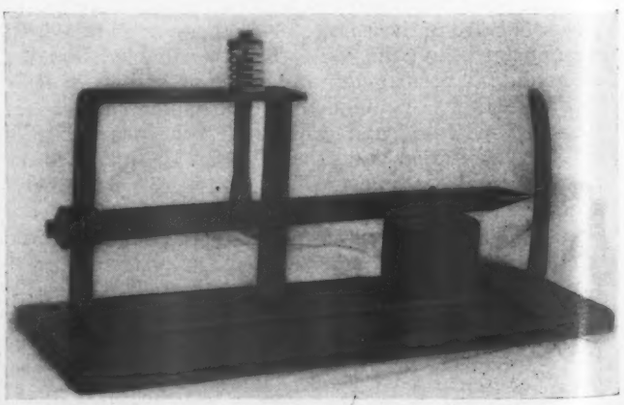
489—*Q.—How many chokes are installed in the relay valve?* A.—One, known as choke No. 12

Tool Used in Type-AB Brake Valve Maintenance

Test No. 18 of the Code of Tests covering the testing of the Type-AB air-brake valve states: "The inshot valve must close when the brake cylinder pressure is increased to not less than 12 lb. or to more than 17 lb. A lower inshot pressure than specified may be due to inshot pilot-valve seat leakage or a weak spring. A low inshot pressure may be raised by shimming the inshot valve spring."

This means that the complete valve portion has to be assembled and placed on the test rack and tested before the value of the inshot-valve spring is known; then, if shimming is necessary, the valve has to be partially dismantled, the shims applied and after the re-assembling, again placed on the test rack for a further test.

This difficulty is overcome with the device illustrated. It is a home-made affair with ¼-in. bar iron used principally in its construction, the over-all length being 18 in. and the height 8 in. The position of the weight and calibrations on the indicator will vary with each testing device made, due to various factors and should be determined by placing a spring that is known to be correct in position as shown in the illustration.



Device used in testing the inshot-valve spring in Type-AB brake valve

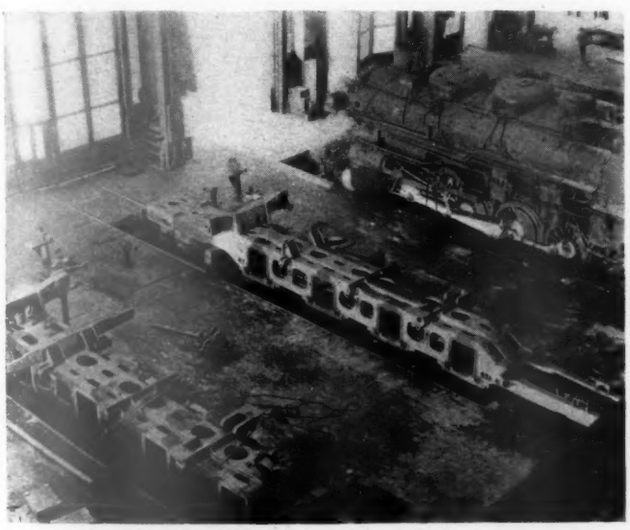
Santa Fe

Rebuilds Ten Locomotives

Heavy 4-8-4 type, 3751-class locomotives are equipped with roller bearings, Boxpok drivers and other improvements in design — How the roller bearings were installed

THE Atchison, Topeka & Santa Fe has converted ten heavy 4-8-4 type steam locomotives, known as the 3751 class, at its Albuquerque, N. M., locomotive shops. These locomotives* were purchased from Baldwin in 1928. They were originally stoker-fired, but a few years ago were changed to oil and this fuel continues in use. They will run through between La Junta, Colo., and Los Angeles, Cal., 1,235 miles. The conversion was completed in July.

The conversion work includes the following: Timken roller bearings applied to all wheels; new and longer smoke box applied; dome closed by inside cap, riveted in place; feedwater heater raised to smokebox location; reciprocating feedwater pump located under left side of cab; pressure raised from 220 to 230 lb.; two extra backhead braces and two extra flue sheet braces applied; size of radial stays around syphons increased; reinforcing pads riveted to barrel and smoke box, all rods new including tandem main rods, and new valve motion.

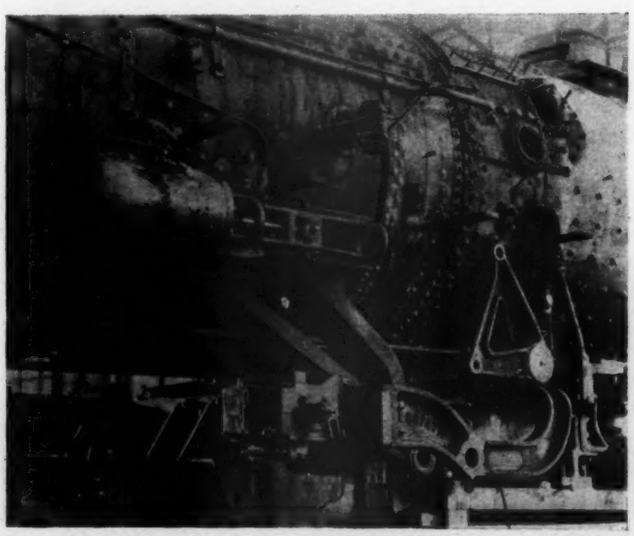


New locomotive bed castings as received from the builder

Boiler and Frames

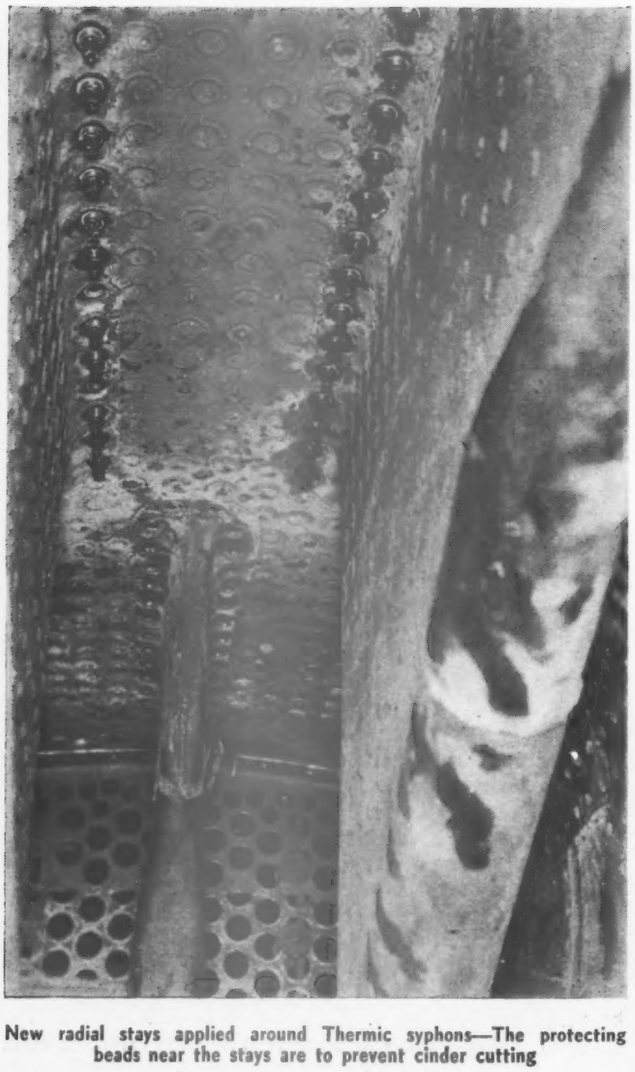
The frames are the Commonwealth locomotive bed type. The pedestal jaws are straight to accommodate the Timken bearing housings that require no wedge, but use bronze-faced shoes between the frame and the housing. In accordance with modern practice, the power reverse gear and air reservoirs are supported from the frame. The brackets for the latter are bolted to the frame and the bracket for the power reverse is included in the link bearer casting. The two belly braces are the floating type and the T-irons bear against heavy reinforcing pads riveted to the shell. The upright sheets of these braces are riveted to the T-irons and bolted to the integral cross members of the frame bed. There are three swing braces connecting the boiler and frame on each side. Two of these are on the smokebox and the other is on the shell.

In stripping, the boiler is cut loose from the cylinder saddle by burning off the heads of the bolts in the smokebox and burning out the part of these saddle bolts that extends through the smokebox. The heavy boiler work is done in the boiler shop. The original cast-steel cylinders are retained in the new design. The increase in pressure from 220 to 230 lb., necessitates two additional backhead braces and two additional back flue-sheet braces, and at this time the size of the radial stays around the siphons were increased to $1\frac{3}{16}$ in. body size. The original front-end throttle arrangement is unchanged and



The power-reverse bracket is cast integral with the link bearer

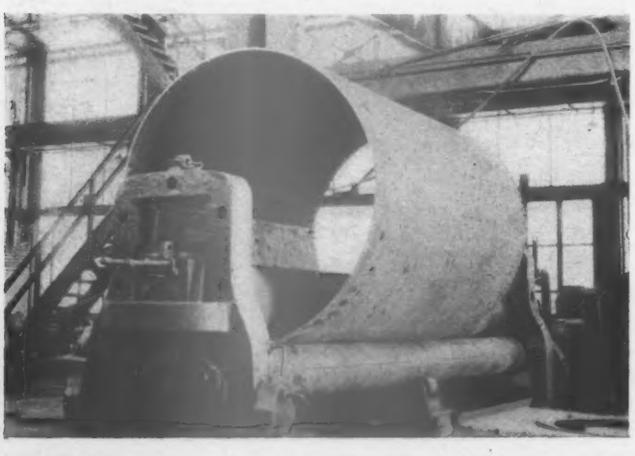
* See *Railway Mechanical Engineer*, July, 1928.



New radial stays applied around Thermic syphons—The protecting beads near the stays are to prevent cinder cutting

after the dome is permanently closed, entrance to the boiler is effected through an auxiliary dome. The original dome cap was slightly modified in shape (for clearance) and was placed inside the dome. The old stud holes in the dome are reamed and the cap riveted and caulked without the use of a gasket. This work was done while the flue sheet was out.

The increase in length of the driving-wheel base to accommodate the 80-in. drivers makes a longer boiler necessary and a new smoke box 11 ft. long was rolled and applied in the local shop. New main steam pipes are necessary between the superheater header and cylinders are several feet ahead of their former position in reference to the front flue sheet. There is little change in the draft appliances. An open-type spark arrester originally developed for coal burners by the Santa Fe test department is used with slight change on oil burners, including the locomotives of the 3751 class.



Smokebox being formed in power rolls at the Albuquerque boiler shop

Driving and Running Gear

Two outstanding additions in this connection are the change to tandem main rods, and the use of the Franklin Railway Supply Company's patented lateral-motion device on the front drivers, made necessary on account of the long driving-wheel base. The front drivers have $\frac{3}{8}$ in. total free lateral, and an additional movement of $\frac{11}{16}$ in. in either direction, against spring action, is provided by the device. The necessary slack for this movement is provided between the roller-bearing housing (boxes) and the shoes. The lateral device centers the wheels by two rollers that extend through slots in the respective spring saddles. Each roller is mounted in a block which forms the inside saddle seat and the roller bears against part of the frame. The thrust of the wheels in rounding a curve is transmitted to one of these rollers which slightly tips the spring saddle against the resistance of the driver spring. The front rod bushings have a spherical bearing in the rod to assure alinement. This device is also used on the front drivers of locomotive 5000, and many features of Santa Fe design that proved so successful on this locomotive are incorporated in the new design for the present conversion.

Inside riveted dome cap—The center of this cap has been set down (before application) by the use of a gas torch and flatter starting at a point about 8 in. from the edge

It is interesting to note that a new method has been developed for laying out the shoes which is different from the ordinary procedure in connection with shoes and wedges. This consists of squaring the frame in the usual way and locating accurately machined bars across the pedestal openings in the positions the axles will occupy. These bars are secured by small bolts to the spreaders that span the frame-jaw openings. The bars are adjusted square and in tram and the shoe thickness figured by measuring from the bars to the pedestal faces with micrometers. No prick punch marks are made on the shoes (which are not in place), but the milling-machine operator is supplied with dimensions in thousandths for each end of each shoe. The locomotive beds are accurately machined by the manufacturer and before the laying-out operation the distance between

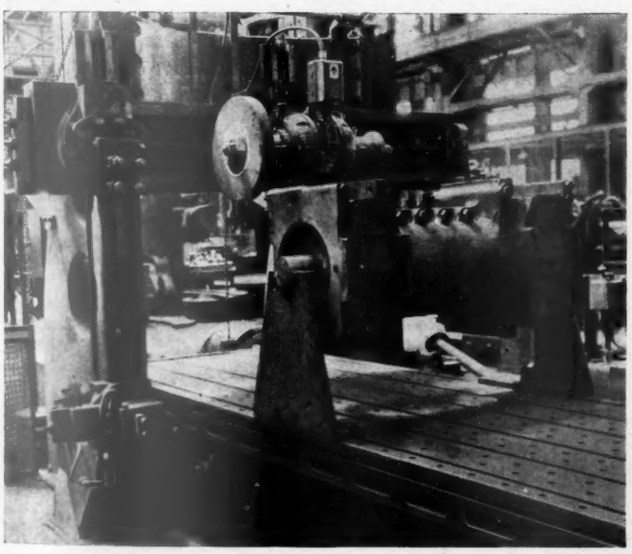
adjacent jaws is checked by offset measuring rods. Slight irregularities are corrected by filing and grinding and the jaws are spot faced. The shoes show little difference in size when finished.

Roller Bearings

The application of roller bearings in the shop is new on the Santa Fe and is an important addition and betterment. New tenders were applied to the 3751 class locomotives at the time of change to oil and these had roller bearings as supplied by the builders. The present conversion includes roller bearings for engine trucks, trailers, and drivers. Doing this work in the railroad shop requires the introduction of new standards of accuracy. Plus or minus .0015 in. is a common notation on the new axle blueprints, and such close tolerances on the location of the cone-backing shoulders on axles require the use of special gages. These are the template type, made by Brown & Sharpe. One of these gages has its length stenciled 37.953125 in. A full set of inside and outside micrometers up to ¼ in. is used at the axle lathe.

Table of Fits, in Inches, for Timken Bearings

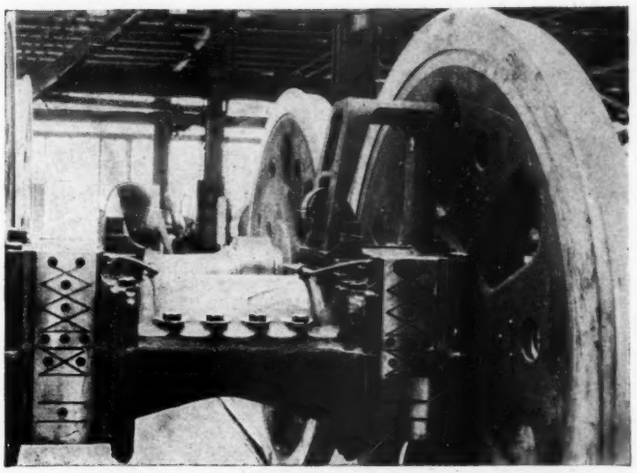
Size of axle and location	Cone fit	Lateral adjustment of bearings	Pedestal fit
7½-in. eng. truck	.002 to .004 tight	.015 to .025 loose	1/16 loose
13½-in. main driver	.002 to .006 tight	outer set of rollers .010, inner set .012 loose	.010 to .015 loose
13 9/16-in. drivers other than main	.002 to .004 tight	outer set of rollers .010, inner set .012 loose	.010 to .015 loose
9-in. trailer	.002 to .004 tight	made at factory	1/32 loose



Special machine set-up for grinding roller-bearing housings on a planer

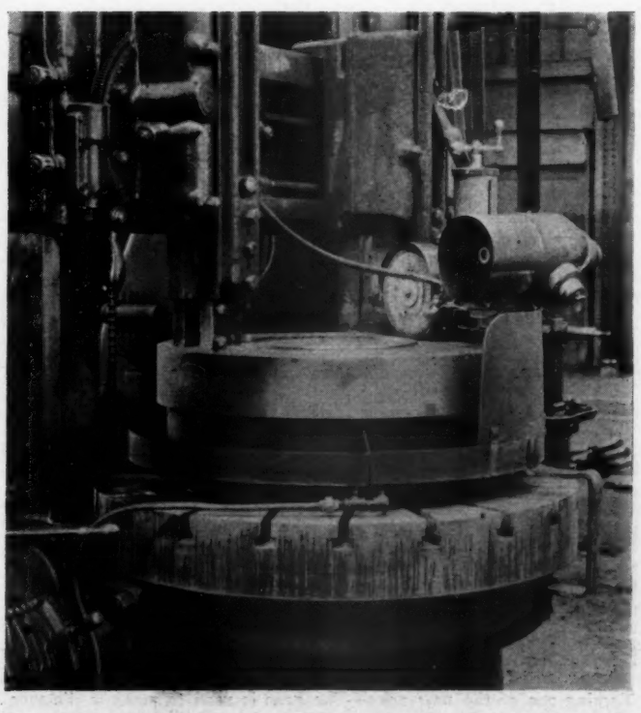
The axles are of Timken design with liberal-radius fillets, and the wheel fit is smooth turned and polished for an inch or more inside the hub where experience and the Timken tests show that fatigue cracks develop. The fits for the bearing cones on the journal portion of the axle are ground on a Landis grinder.

Several new wheel-press jibs and fixtures are necessary to mount these bearings. For mounting outside-journal truck bearings, a pilot sleeve is provided which fits over the axle stub. (About 1½ in. at the end of the axle is reduced in diameter and takes a press fit collar.) This pilot keeps the cone square as the fit enters. Heavy press fits on roller-bearing parts are not necessary or desirable. The thrust developed in rounding curves is transmitted to a shoulder on the axle, and, unlike a wheel, the bearing parts do not depend on the fit alone to hold them in position. In mounting these parts little attention is paid to tonnage except that a maximum of 25 tons is mentioned. The fit allowance is carefully checked with micrometers and the proper amount of interference with .001 in. plus or minus, is maintained. Castor oil and white lead are used as a lubricant on roller-bearing fits.



Timken roller-bearing housing in place on the front drivers—The Franklin lateral-motion device is shown on one side

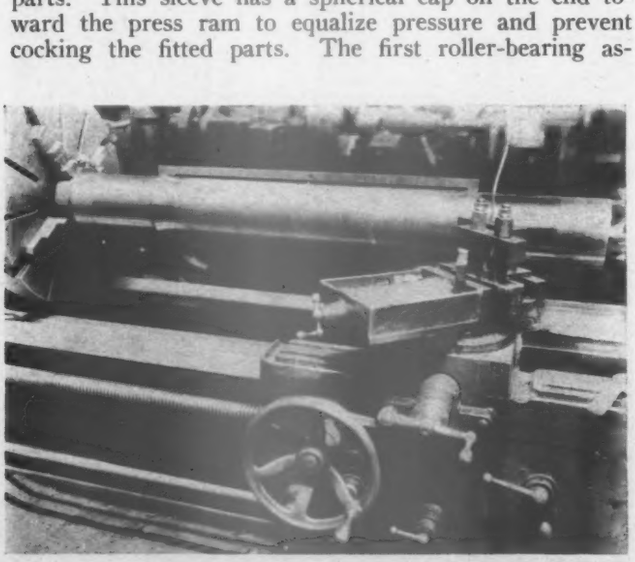
The exact procedure for mounting a Timken trailer bearing on outside journels is as follows: For shipment the parts are covered with a light coat of oil. Before mounting, this protective coating is removed by washing the parts in distillate. The mounted wheels are placed in the wheel press as if the axle were to be pressed



Magnetic chuck and grinder attachment used in grinding the lateral strips for Timken driver bearings on a boring mill

Magnetic squares used in counterbalancing locomotive driving wheels at Albuquerque shops

out. The enclosure (inner portion of housing) is placed over the axle against the hub with the bolts in place. This enclosure has four grooves on the inside which act as an oil seal and these are filled with valve oil to assure initial lubrication before the enclosure is applied. The oil flinger that supplements the seal is pressed in place. A freely fitting sleeve is used to press on these bearing parts. This sleeve has a spherical cap on the end toward the press ram to equalize pressure and prevent cocking the fitted parts. The first roller-bearing assembly, which includes the cone, rollers, and the flinger, is then pressed on, using the pilot fixture mentioned in a previous paragraph to start it straight. The cone spacing ring is applied next, and then the second roller bearing, after the cups are placed in position. The collar is then pressed on the end of the axle. The cup-spacing ring is in halves which may be fastened together by wire until the housing is slipped in place.



Turning one of the new axles—The gage is used to measure distance between cone-backing shoulders—The portion of each wheel fit near the inside hub face is rolled

It is interesting to note that the rollers are within .0001 in. of the same size, and this size is etched on the large end of each roller.

To check the lateral of the roller bearing, a dial indicator is used. The axle (inside journals) is turned on end preferably before the wheels are mounted and the bearing housing raised to the limit of its free motion. The load is released and the housing jarred down with a soft sledge. The dial indicator is clamped by a band around the axle and indicates the lateral movement of the housing in thousandths.

Wheel Shop Practice

Press fits on the Santa Fe are lubricated with mineral paint (box car red) mixed with boiled linseed oil. A gallon of oil is used to thin 18 lb. of brown semi plaste, which makes it about as thick as a priming coat of paint.

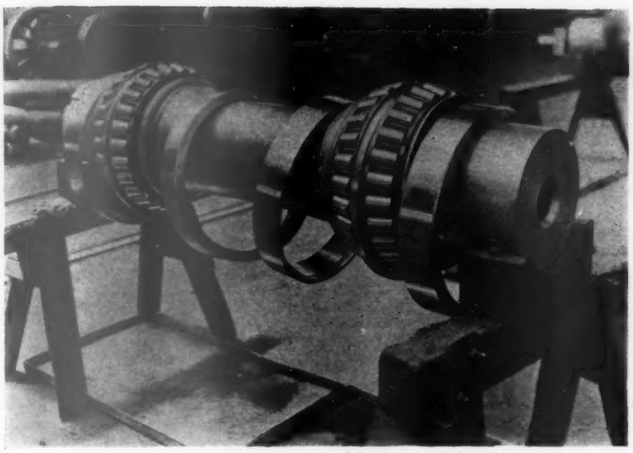
Wheel department with a pair of front drivers on the counterbalancing stand—Lead slugs, shown on the floor, are driven in holes to adjust the balance—The roller-bearing frame is for weights used to balance the wheels

This is prepared fresh each week, and is applied just before the parts are pressed together.

Counterbalancing

The method of counterbalancing at Albuquerque is essentially the same as followed in other large shops and locomotive works. The Boxpok main wheels have riveted plates covering the outside of the counterbalance space. These wheels are filled with lead before being mounted, while flat on the floor, and the lead is pounded with a long stroke riveting hammer to tighten it after it cools. All the wheels except the mains have solid steel counterweights, and three 3¼-in. holes are drilled in the back of these for slight adjustment of the balance. The main wheels have cored holes in the back of the balance for the same purpose.

The main wheels and intermediate wheels are cross-balanced, 8 deg. and 59 min. on the main and 5 deg. and



Main driver axle with roller-bearings mounted in place ready for assembly in the housing

59 min. on the number three. The counterbalances are off center this amount toward the opposite pin. When on the balancing strips, with the counterbalances properly adjusted, and the correct weight hung on the opposite pin, the main pin will be $2\frac{7}{16}$ in. out of plumb and the number three pin will be $1\frac{11}{16}$ in. out of plumb. One of the illustrations gives a view of the wheel bay where counterbalancing is done and another shows a couple of handy magnets used for squares which stick to the end of the axle and are useful in counterbalancing. After a few trials it was possible to machine the wheels so accurately that changes of less than 50 lb. (at pin radius) were required.

Babbitting Locomotive Crown Brasses

By H. C. Venter*

In order to reduce passenger locomotive failures resulting from hot driver bearings, the Southern Pacific fitted up four 4-8-2 type locomotives with oil lubrication on the driving-wheel and truck journal boxes. These four locomotives have been in continuous service long enough to demonstrate: (1) That hot driver bearings can be materially reduced; (2) that the cost of lubrication per 1,000 locomotive miles is reduced 48 per cent; (3) that there is less wear on the axles; (4) less danger of scoring the journal if a box does run hot; (5) driving boxes run much cooler when lubricated with oil.

The mechanical details of this system of oil lubrication for locomotive driving wheel and truck journals were described in the March issue of *Railway Mechanical Engineer*. Putting the crown brasses on oil made it necessary to babbitt these brasses with a suitable bearing metal, which had to possess strength, a fair ductility, a fairly high melting point and not be too easily deformed when under load. A high-tin babbitt, containing 85 per cent tin, 10 per cent antimony and 5 per cent copper, was selected for lining the crown and truck and trailer brasses, while the hub faces were lined with Satco metal.

This type of babbitt has excellent bonding characteristics and no difficulty is encountered in obtaining a firm adherent bond of babbitt to brass, and so far there has not been any case of loose linings with this high-tin babbitt, which is called copper babbitt No. 9.

The following bonding tests were made to compare the bonding strength of copper babbitt No. 9 and the standard A. A. R. babbitt as covered by the A. A. R. Specification M-501-34 wherein the tin plus antimony must not be less than 14 per cent, the balance to be lead.

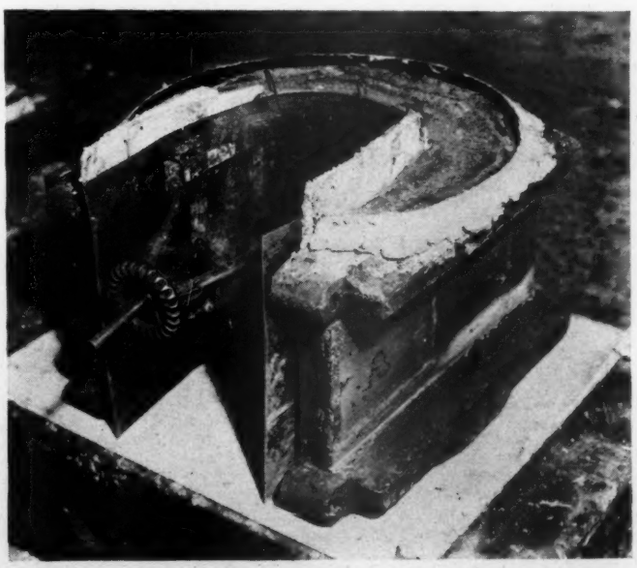
These tests bring out the fact that the bonding strength of the copper babbitt No. 9 is some 21 to 26 per cent higher than that of the A. A. R. babbitt when using the same tinning flux and the same tinning bath for both babbitts:

Bonding Strength of Babbitt to Brass

Test No.	Kind of babbitt	Tinning flux	Composition of tinning bath	Load in lb. per sq. in. to rupture bond	
1	A.A.R.	*Special	½ lead and ½ tin	6,000	
2	A.A.R.	*Special	½ lead and ½ tin	5,720	Average 5,860
3	A.A.R.	*Special	½ lead and ½ tin	5,860	
4	A.A.R.	20 per cent zinc chloride	½ lead and ½ tin	5,600	
5	A.A.R.	20 per cent zinc chloride	½ lead and ½ tin	5,720	Average 5,616
6	A.A.R.	20 per cent zinc chloride	½ lead and ½ tin	5,530	
7	Copper babbitt No. 9	20 per cent zinc chloride	½ lead and ½ tin	7,060	
8	Copper babbitt No. 9	20 per cent zinc chloride	½ lead and ½ tin	7,130	Average 7,080
9	Copper babbitt No. 9	20 per cent zinc chloride	½ lead and ½ tin	7,050	

* Special tinning solution consisting of zinc and tin chlorides.

The crown brasses are notched, as illustrated, to obtain a greater bonding area and are then pressed into the box before babbitting. The whole assembly is prewarmed and a zinc chloride tinning solution is then applied to the hub face and the notched part of the brass. The box is placed in the tinning bath with the hub face on the bottom, the bath being maintained at a temperature of 540 deg. F. A small hand ladle is used to dip up and pour the tinning metal over the exposed grooves of the brass. After standing in the bath for three to five minutes, the box is turned upside down, thus exposing the tinned hub face; tinning metal is again



Sheet-metal form and hand-screw expander used in preparing a driving-box hub face for pouring the babbitt

* Shop superintendent, Southern Pacific, Sacramento, Cal.

Notched crown brass being pre-warmed preliminary to tinning

poured over the grooves and the whole grooved surface is thus tinned. When properly done, the tinning metal will evenly distribute itself over the grooved surface.

After removing from the tin bath, a tinned brass wire screen is spot brazed in eight places to the hub face. These spots are tinned by applying zinc chloride tinning fluid and rubbing with a stick of solder, there being enough heat in the box to melt the solder.. The hub face is then babbitted with Satco metal which is poured at a temperature of approximately 1,050 deg. F. To assure a bond between the Satco babbitt on the hub face and the copper babbitt No. 9 of the crown brass, zinc chloride tinning fluid is applied to the inner edge of hub face nearest to the axle.

The box still being sufficiently warm, the crown brass is then babbitted with copper babbitt No. 9, which is poured at a temperature of 800 to 830 deg. F.

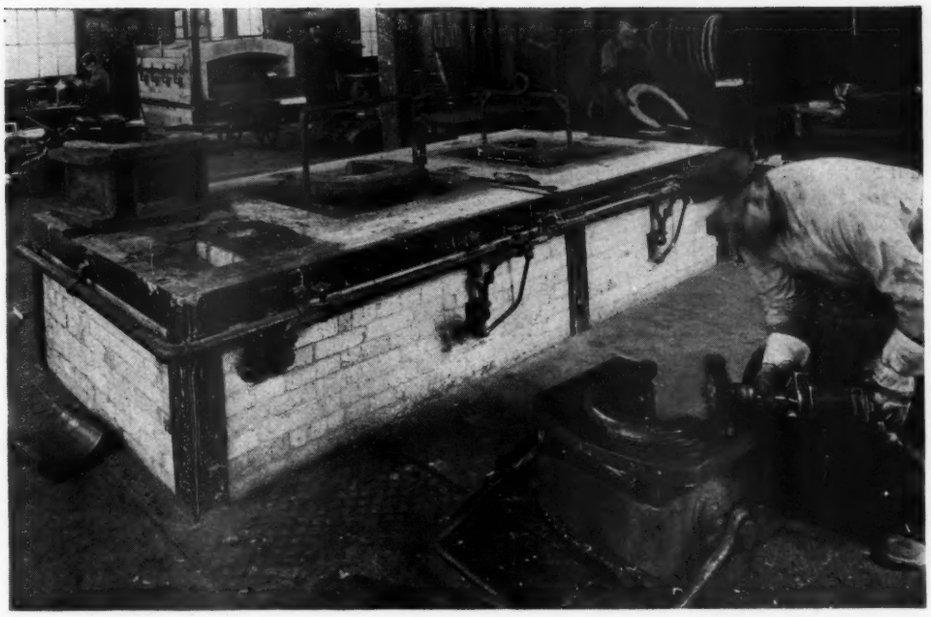
A tilting device was developed so that these boxes could be safely and conveniently handled. It consists of a U-shape steel frame, made of 1-in. by 6-in. stock, with a 1-in. hole near the end of each leg in order that a long bolt may be inserted and thus close up the open end. On each side of the U-frame, a trunnion is welded in place and a ring welded to the outer end of each trunnion to prevent the one-piece forged-steel bail, made of 1-in. round bar stock, from spreading or slipping off.

The interesting feature of this device is that it can be spun around on the trunnions through 180 deg. at which point it always locks itself in the horizontal position.

Driving box poured with copper babbitt No. 9 on the crown brass and Satco metal on the hub face

This is accomplished by a vertical key-bar, connected to one side of the bail, as illustrated, and designed to engage a slot in the trunnion end. A small coil spring, located 3 in. above where the key-bar is attached to the bail forces the upper end of the bar outward and away

Oil-fired furnace and equipment used in making copper babbitt No. 9



Furnace equipment used in heating and tinning driving boxes preparatory to babbitting

from the bail, while the other end is pressed against the trunnion which is slotted to receive the bar.

Thus it can be seen that the bar is held in place by the spring which acts to keep the bar always bearing against the trunnion. The spring is made so that a moderate pressure of the hand on the top of the bar will compress the spring and release the trunnion.

The Southern Pacific manufactures its own high-tin babbitt (copper babbitt No. 9), using only the purest grades of tin, antimony and copper. The copper used is electrolytic sheet copper, or clippings and punchings from new sheet copper, which are satisfactory if clean, and reduce the cost of this item.

To make this babbitt, the tin is first melted under a cover of charcoal, and when the temperature rises to 700 deg. F., the copper is added. At this point sal-ammoniac is added which aids in cleaning up the oxides on the surface of the metal and causes the surface of the copper to tin, and once tinned it rapidly alloys with the tin above 750 deg. F.

It may be of interest to note that below 700 deg. F. the copper alloys slowly with tin, while at 800 deg. F. it is readily alloyed. Five per cent of copper in sheet form can be alloyed in approximately ten minutes. After the copper is all alloyed the antimony is added in small pieces about the size of a walnut, and the metal held between 800 and 850 deg. F., with frequent stirring until the antimony is alloyed, which will take a little longer than in the case of the copper. The metal is then skimmed and poured into 25-lb. pigs and is stored for future use.

Driving-box holder which may be indexed to either of two 180 deg. positions

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Locating the Center of Circular Disks

Q.—What is a simple method for obtaining the centers of circular disks?—M. J. F.

A.—For small disks, up to 24 in. in diameter, a con-

venient method is to place an ordinary steel square on the disk with the corner of the square flush with the edge of the disk and then draw lines along the two sides of the square until each intersects the edge of the disk. These two lines will form the two sides of a right-angle triangle. From the points where the lines intersect the edge of the disk draw a third line forming the hypotenuse of the triangle. Repeat this process, moving the square around the disk about 90 deg. each time, until three triangles are formed on the disk. The point of intersection of the hypotenuse of the three triangles thus formed is the center of the disk.

When a square is not available the same idea can be accomplished by the use of dividers. Open the dividers any convenient distance and with one leg held exactly at a point on the edge of the disk, describe two short arcs, across the edges of the disk, both points on the edge of the disk. Then, with the dividers open a little further, place one leg in succession at each of the points marked on the edges of the disk and describe two short arcs which will intersect near the edge of the disk opposite the point of beginning. The first point is connected with a line to the intersection just made. Then select another point on the edge of the disk at about 90 deg. from the first point. Repeat the operations from the second point and where the two lines intersect will be the required center of the disk.

Hand Rails Extended to the Head-Log Casting Break When Securely Fastened

Q.—We have had considerable trouble with the handrails of our Pacific-type locomotives when they are extended down from the side of the boiler to the bumper deck. We find the handrails broken where they enter the fitting on the bumper deck. What is the cause of this trouble and can it be remedied?—A. F. D.

A.—The breaking of the handrails is probably due to the expansion and contraction of the boiler. I assume that the handrails are securely fastened to the side of the boiler and set down into a typical handrail bracket on the bumper deck. With this arrangement the movement of the boiler is transmitted to the handrail, and carried down to the bumper deck, which however, does not expand or contract with the boiler. This movement causes a strain on the handrail just above the point where the handrail enters the handrail bracket on the bumper deck, causing the handrail to fracture at this point.

This condition can be remedied by freeing the handrail so that the strains set up due to the expansion and contraction of the boiler are eliminated. This can be done by freeing the handrails in the handrail columns and bumper deck casting, or providing a slip joint in the handrail itself.

A Boiler Problem—Prize Competition

The accompanying drawing and text describe the boiler patch selected by the judges as the winner of the second prize in the competition announced in the March issue. It was submitted by J. E. Harrison, general boiler foreman, Central of Georgia, Macon, Ga.

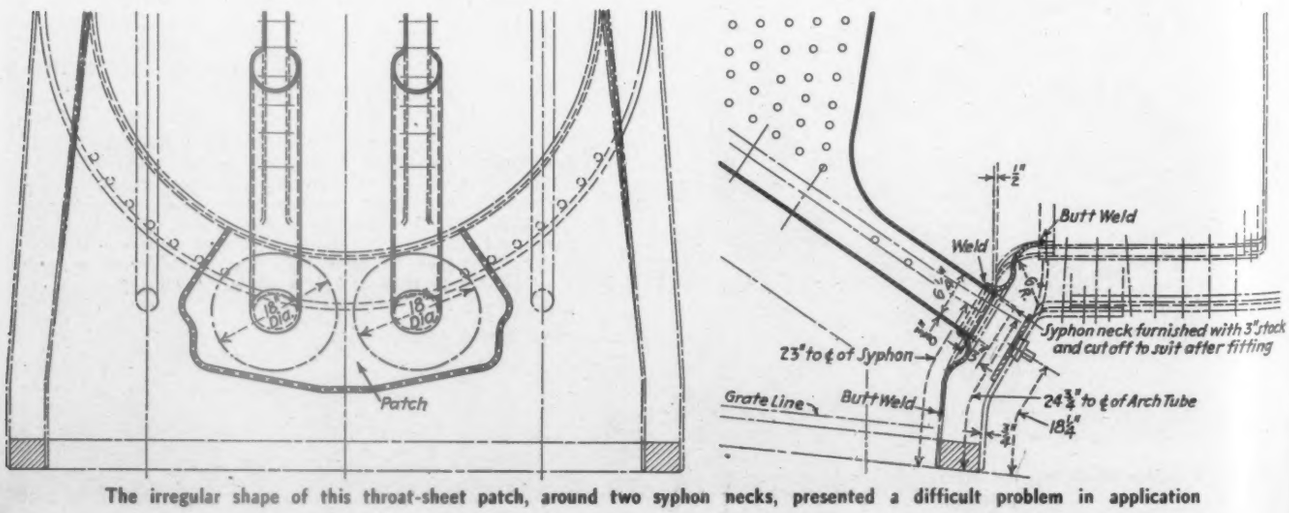
The accompanying drawing shows a firebox throat-sheet patch as applied to a 4-8-2 type locomotive boiler, equipped with syphons.

The problem of patching a firebox at the throat sheet, where the patch is extended to the combustion chamber, is always a difficult one, due to the irregular shape of the patch. In this case, the patch was even more difficult due to the fact that it not only had to be shaped and fitted to the contour of the throat at the combustion chamber, but also had to be lined up to fit the necks of the syphons as well.

After the patch was flanged to shape, the greatest difficulty was experienced in fitting it to the firebox, due to the fact that a patch in this location is extremely hard to hold in place while making final adjustments in the shape of the patch. With an ordinary patch, it is possible to bolt it in place while fitting it to the boiler. With this type of patch the only means of holding it was through the staybolt holes.

The patch was applied by working from the bottom up. It was first lined up along the bottom and then fitted over the necks of the syphons and held in place through the staybolt holes. It was then fitted to the contour of the combustion chamber. This was a difficult part of the job due to the fact that after setting the patch in place, it was only possible to work on it from one side of the plate while flanging it to fit the combustion chamber.

Under the flanging conditions it was not only necessary to keep the "OG" in shape but also line it up with the necks of the syphons while maintaining the proper angle of the inside throat sheet. After fitting the patch in place it was butt welded all around using $\frac{5}{32}$-in. electrodes.



The irregular shape of this throat-sheet patch, around two syphon necks, presented a difficult problem in application

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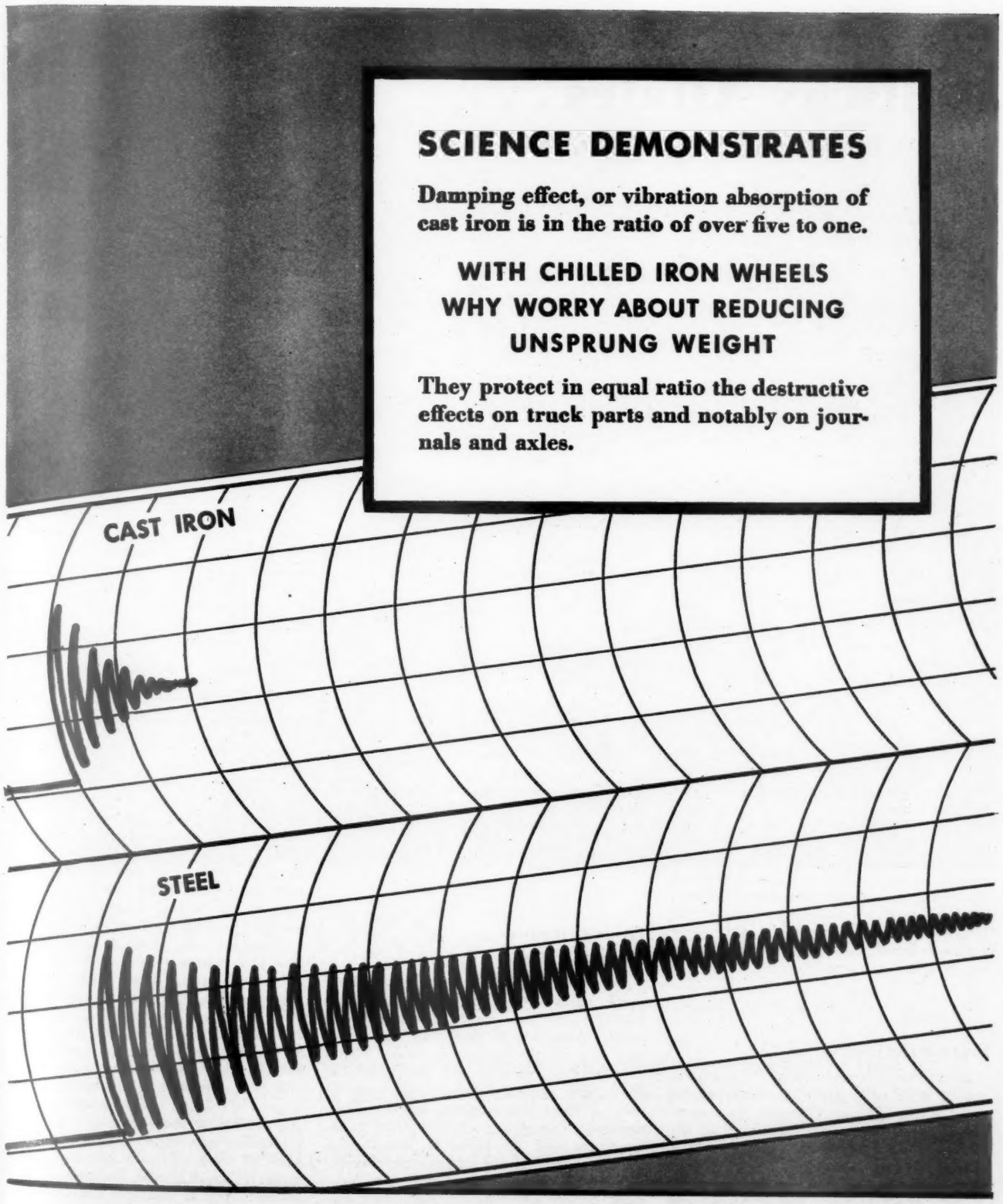
SCIENCE DEMONSTRATES
Damping effect, or vibration absorption of cast iron is in the ratio of over five to one.
WITH CHILLED IRON WHEELS WHY WORRY ABOUT REDUCING UNSPRUNG WEIGHT
They protect in equal ratio the destructive effects on truck parts and notably on journals and axles.
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More Railroad Jobs

Railway employment increased from 991,900 in mid-June of this year to 1,002,-135 in mid-July. This latter figure is a decided increase over that for July of last year—7.7 per cent to be exact. The largest percentage increase came in the maintenance of equipment and stores group, 13.34 per cent, but was very closely followed by the maintenance of way and structures group, with a 13.32 per cent increase. If we take an index figure of 100 for the average railway employment for July in 1923-25, then the index figure on July 15 last year was 50.8 and for mid-July this year, 54.7.

People Don't Want Government Ownership

In commenting in a radio address upon the accomplishments of the recent session of Congress, House Majority Leader Rayburn said, "I do not believe that the American people want government ownership of railroads. I certainly do not. One of the surest ways to prevent it is to enact fair and just transportation legislation that will bring under government control all instrumentalities of interstate commerce. * * * The recent session of Congress—both House and Senate—approved of legislation to bring under regulation all forms of transportation in an effort to stop cut-throat competition and have a well rounded transportation set-up in the country. These bills are now in conference between the House and the Senate and it is the hope that an efficient, workable law will come out of these deliberations."

Prize Winning Name

More than three-quarters of a million entries were received in the contest sponsored by the Pullman Company for a name for a roomette car on exhibition at the New York World's Fair. American Mile Master proved to be the winning name. The most popular names suggested were Magic Carpet, Mercury, Silver Streak and Travel Ease. During the last three days of the contest, which extended from April 25 to June 15, a quarter of a million entries were received. A force of more than 100 people was required to sort, file and index the names. The contestants whose 25 names were selected by the judges were each given a pair of trips to either the New York or the San Francisco Fair. In addition, those who included with their entries the correct rail and Pullman fares to the exposition they preferred to visit, were given $200. in spending money. Five hundred consolation prizes of one dollar each were also awarded. To each ticket agent or ticket seller whose names appeared on the entry blanks of the major prize winners, $25. was given.

Suggestions For Improvements

An Employees' Suggestion System was inaugurated by the Illinois Central on March 6 of this year. Between that date and July 20 employees of the road turned in 6,650 suggestions for the reduction of costs or improvements in the service. Allowing for those who sent in more than one suggestion, it is said that one out of every five employees contributed ideas. The suggestions are made on numbered cards, which are unsigned, the employees retaining the stubs of the cards on which the suggestions are made. Cash awards have been given thus far for 232 suggestions and at least 100 more are being studied to determine their practicability. The numbers of those suggestions which are given awards are announced in a weekly bulletin and the winners present the stubs to claim these awards. The general suggestion committee includes a representative of the organized employees and representatives of the major departments of the railroad.

Texas Prohibits Sunday Trucks

More and more are automobilists taking to the highways over the weekends and on holidays—and how they do cuss the unwieldy motor trucks that block the roads and shut off the landscape ahead! Frequently the truck drivers are strangely thoughtless and indifferent to the convenience of those behind them, when a little courtesy on their part would help the traffic movement and do much to smooth the ruffled feelings of the pleasure car drivers. The worm will turn, however, as is indicated by the action of the Railroad Commission of Texas in prohibiting operation of commercial trucks upon the trunk highways of that state on Sundays and holidays. The order indicates that its purpose is the protection of human lives. It does not apply to farmers and other private operators who own their trucks, and exceptions are also made for trucks transporting fresh meats, fish, poultry, poultry products, milk and dairy products, fresh fruits and vegetables and any commodity requiring refrigeration in transit.

S.2009 Lost In the Shuffle

We had high hopes that S.2009, the railroad bill that seemed to afford some promise of real relief to the railroads, would be enacted. It passed the House so late, however, July 26, and was so different from the bill of the same number that had been passed by the Senate, that there was no time to adjust it in conference and secure the approval of the two houses. Moreover, high pressure propagandists of special interests had been able to secure modifications in the original bills which greatly decreased their effectiveness from the standpoint of the public welfare and of giving real relief to the railroads. It is proposed now to have the conferees get together some time in December in an effort to frame a conference report for presentation early in the next session of Congress. Let us hope that they will do a statesmanlike job and not be swayed by self-seeking propagandists.

Little Railroad Legislation Enacted

The railroad question in its present aggravated form is not a new one by any means. It seems to be generally admitted that it is a pressing problem of first importance from the viewpoint of national welfare, but Congress never seems to find time to do anything really worth while about it. Yes, there were lots of hearings and much talk at the session which adjourned on August 5, but out of it all came the enactment of only a few relatively unimportant bills. One of these was the Chandler voluntary railroad reorganization bill, which gives legal sanction to such plans for readjustments of capital structures as have been worked out by the Baltimore & Ohio and the Lehigh Valley. There was also an amendment to Section 77 of the Bankruptcy Act, to provide that personal injury claims of employees of roads in reorganization shall be charged to operating expenses. The R. F. C. lending powers were also extended to June 30, 1941. Certain amendments were made to the Railroad Unemployment Insurance Act to facilitate the administration of that law. The general tax bill embodied potential sources of relief for the railroads in those provisions for the repeal of the undistributed profits tax and those which will permit roads in financial difficulties to purchase their own obligations at a discount, without being liable for capital gains taxes on paper profits. While these measures are not unimportant, they hardly scratch the surface, so far as real relief from unfair conditions is concerned.

(*Turn to next left-hand page*)

METHODS AND MACHINERY THAT GUARD LIMA QUALITY

GOOD LOOKS . . . *is good business*

In a light and airy paint shop, the modern locomotive gets the finishing touch.

And in these days when styling and appearance are important in building traffic and public acceptance, Lima is justly proud of its paint work.

Proper ventilation and temperature for uniform drying were particularly sought after in building this shop.

As a result, the final appearance of Lima locomotives does credit to the unseen workmanship that makes quality of performance.

LIMA LOCOMOTIVE WORKS, LIMA LOCOMOTIVE WORKS INCORPORATED INCORPORATED, LIMA, OHIO

Among the Clubs and Associations

NORTHWEST CAR MEN'S ASSOCIATION.—Meeting held September 6 at St. Paul, Minn. Open discussion on questions and problems of car inspectors and car repairers.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Meeting at 8 p.m., September 11, at the La Salle Hotel, Chicago. Open meeting night for the discussion of car-department problems.

TORONTO RAILWAY CLUB.—Meeting 8 p.m., September 25, Royal York Hotel, Toronto. A paper on the Handling of Dangerous Articles in Transportation, will be presented by A. H. McMullen, inspector, Bureau of Explosives.

BRITISH-AMERICAN ENGINEERING CONGRESS.—The joint meeting of the British Institution of Mechanical Engineers, the American Society of Engineers, the American Society of Civil Engineers, and the Engineering Institute of Canada, scheduled for September 4-8 at New York, and all functions in connection therewith were cancelled on August 26 because of the inability of many of the British engineers to visit America while unsettled conditions prevail in Europe. Arrangements for the presentation of the technical papers prepared for this meeting will be announced later.

PACIFIC RAILWAY CLUB.—At a meeting called especially to consider the matter, the board of governors of the Pacific Railway Club recently decided to increase the club's activities by conducting monthly meetings alternately in northern and southern California, and by amending the club's constitution so that commencing with the next fiscal year there will be an increase in the number of vice-presidents from two to four, two of whom will be from each portion of the state. With about 40 members in southern California the club has been holding one meeting each year in Los Angeles, usually in September. ¶It is now proposed to engage in a campaign to bring the southern California membership to a total of at least 150, and with the additional revenue thus obtained to hold at least four, and possibly six, meetings there. While the holding of these meetings in Los Angeles will necessarily mean fewer meetings in San Francisco, all members will receive the transcripts of all meetings in the club's monthly publication, and it is believed that many of the club members will attend meetings in both parts of the state. ¶The first meeting in Los Angeles will be Friday evening, September 15, at the Hotel Hayward.

High-Speed Trains

A REGIONAL meeting of the Society of Automotive Engineers to be held in Chicago on October 6 will be devoted to the discussion of highspeed streamline trains. The speakers include Carl R. Gray, Jr., executive vice-president of the Chicago, St. Paul, Minneapolis & Omaha, and Col. E. J. W. Ragsdale, chief engineer of the Edward G. Budd Manufacturing Company. An inspection trip to the Chicago & North Western's facilities at Sacramento and California avenues, Chicago, is also included in the program.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—R. P. Ives, Westinghouse Air Brake Company, 3400 Empire State building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—C. E. Davies, 29 West Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, P. O. Box 205, Livingston, N. J.

MACHINE SHOP PRACTICE DIVISION.—Erik Aberg, editor, Machinery, 148 Lafayette St., New York.

MATERIALS HANDLING DIVISION.—F. J. Shepard, Jr., Lewis-Shepard Co., Watertown Station, Boston, Mass.

OIL AND GAS POWER DIVISION.—M. J. Reed, 2 West Forty-fifth street, New York.

FUELS DIVISION.—A. R. Mumford, Consolidated Edison Co., 4 Irving Place, New York.

ASSOCIATION OF AMERICAN RAILROADS.—J. M. Symes, vice-president operations and maintenance department, Transportation Building, Washington, D. C.

OPERATING SECTION.—J. C. Caviston, 30 Vesey street, New York.

MECHANICAL DIVISION.—V. R. Hawthorne, 59 East Van Buren street, Chicago. Annual meeting, June 28, 29 and 30, at the Commodore Hotel, New York.

PURCHASES AND STORES DIVISION.—W. J. Farrell, 30 Vesey street, New York.

MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington, D. C.

CANADIAN RAILWAY CLUB.—C. R. Crook, 4468 Oxford avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis, Mo.

CAR DEPARTMENT OFFICERS' ASSOCIATION.—Frank Kartheiser, chief clerk, Mechanical Dept., C. B. & Q., Chicago. Meeting, October 17, 18 and 19, Hotel Sherman, Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month at 1:15 p. m.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMEN'S ASSOCIATION.—Roy MacLeod, Room 127, General Office Bldg., N. Y., N. H. & H., New Haven, Conn. Regular meetings, second Friday of January, February, March, April and October at Engineering Societies Bldg., 29 West 39th street, New York.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four Building, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—See Railway Fuel and Traveling Engineers' Association. Meeting third week in October, Hotel Sherman, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—See Locomotive Maintenance Officers' Association.

LOCOMOTIVE MAINTENANCE OFFICERS' ASSOCIATION.—F. T. James, division master mechanic, D. L. & W., Hoboken, N. J.

MASTER BOILER MAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y. Annual meeting, October 17, 18, and 19, Hotel Sherman, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Avenue, Boston, Mass. Regular meetings, second Tuesday in each month, except June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings, first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Monthly meetings alternately in northern and southern California.

RAILWAY CLUB OF GREENVILLE.—Sterle H. Nottingham, Greenville, Pa. Regular meetings, third Thursday in month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month, except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FUEL AND TRAVELING ENGINEERS' ASSOCIATION.—T. Duff Smith, 1255 Old Colony building, Chicago. Annual meeting October 17, 18, and 19, Hotel Sherman, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, Association of American Railroads.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July and August, at Royal York Hotel, Toronto, Ont.

TRAVELING ENGINEERS' ASSOCIATION.—See Railway Fuel and Traveling Engineers' Association.

WESTERN RAILWAY CLUB.—W. L. Fox, executive secretary, Room 822, 310 South Michigan avenue, Chicago. Regular meetings, third Monday in each month, except June, July, August and September.

(*Turn to next left-hand page*)

FOR EASE OF MAINTENANCE AND HANDLING

Specify the No. 8 Combined Lubricator and Spreader

The New reversible cellar of the Franklin No. 8 Combined Lubricator and Spreader weighs less than half of the old cast steel cellar; yet its design assures an even better lubricating job. This fabricated steel unit, in which the hub end wall is integral with the spreader, makes possible a light, open-end cellar which brings the perforated plate closer to the hub. » » » Despite the drastic reduction in weight, the fabricated steel construction effectively eliminates the possibility of the jaws of the driving box closing in and pinching the cellar. For new power or replacements, specify the Franklin No. 8 Combined Lubricator and Spreader and secure better lubrication with a minimum of weight.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK
CHICAGO
MONTREAL

NEWS

New Books—A Correction

"MACHINE DESIGN" reviewed on page 322 of the August issue of the *Railway Mechanical Engineer* can be obtained at a cost of $3, rather than $5 as mentioned therein.

Equipment Depreciation Rates

EQUIPMENT depreciation rates for nine railroads, including the Minneapolis & St. Louis and the Detroit & Toledo Shore Line, have been prescribed by the Interstate Commerce Commission, in a new series of modifications of previous suborders in No. 15,100, Depreciation Charges of Steam Railroad Companies. The composite percentages for all equipment, which are not prescribed rates, range from 2.55 per cent for the Staten Island Rapid Transit to 10.8 per cent for the Augusta Northern.

The M. & St. L.'s composite percentage of 3.43 is derived from prescribed rates as follows: Steam locomotives, 3.02 per cent; other locomotives, 3.26 per cent; freight-train cars, 3.46 per cent; passenger-train cars, 4.26 per cent; work equipment, 4.79 per cent; miscellaneous equipment, 14.82 per cent. The Detroit & Toledo Shore Line, with a composite percentage of 3.89, gets prescribed rates as follows: Steam locomotives, 3.93 per cent; freight-train cars, 3.74 per cent; work equipment, 4.46 per cent.

New Equipment Orders and Inquiries Announced Since the Closing of the August Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Loco.	Builder
Maine Central	2	600-hp. Diesel-elec.	American Loco. Co.
United States Navy Dept.	1	50-ton Diesel-elec.	Atlas Car & Mfg. Co.

LOCOMOTIVE INQUIRIES

Road	No. of Locos.	Type of Loco.	Builder
Panama Canal	5 or 10[1]	2-6-0	.....
Southern New York Rwy, Inc.	1	40- or 50-ton Gasoline or Diesel-elec.	.....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
American Refrig. Transit Co.	100	Refrigerator	Company Shops
B. & O.	180[2]	Auto	Company Shops
N. Y., C. & St. L.	10	110-ton gondola type containers	Pullman-Std. Car Mfg. Co.
	25	70-ton covered hoppers	American Car & Fdry. Co.

FREIGHT-CAR INQUIRIES

Road	No. of Cars	Type of Car	Builder
C. & O.	2,000	50-ton hopper	.....
	400	50-ton gondola with steel floors	.....
	100	50-ton gondola with wood floors	.....
C. & N. W.	500	70-ton hopper	.....
	300	50-ton furniture	.....
Minn. & St. Louis	35	40-ton automobile	.....
N. Y., N. H. & H.	250	50-ton hopper	.....
Virginian	500	55-ton hopper	.....

[1] Purchase contemplated.
[2] Steel double-door type, to be built at Cumberland, Md., and Keyser, W. Va.

NOTES: *The Union Pacific*, the *Southern Pacific* and the *Chicago & North Western* plan to purchase two 17-car streamlined trains with delivery early next year. One of the trains will be used between Chicago and San Francisco, Cal., and the other between Chicago and Los Angeles.

The New York, Susquehanna & Western has applied to the federal court in New Jersey for permission to purchase two streamline high-speed air-conditioned rail-motor cars, for service between New York and Paterson, N. J., and Butler, the cars to be equipped for double-end operation by two-man crews and afford seats for 78 passengers.

Auto-Loading Devices Installation

THE Missouri Pacific has been authorized by the federal district court to modernize automobile loading devices on 200 automobile box cars at an estimated cost of $84,205.

11,351 Air-Conditioned Cars

CLASS I railroads and the Pullman Company had 11,351 air-conditioned passenger cars in service on July 1, according to reports received by the Association of American Railroads and made public August 24. Of that number 6,327 belong to Class I roads and 5,024 belong to the Pullman Company. In the year ended on July 1, 548 passenger cars were air-conditioned, of which 465 were owned by the railroads and 83 by the Pullman Company.

"As a result of the increase that has taken place in the past few years in the number of air-conditioned cars, practically all the through passenger trains in every part of the United States are now air-conditioned," the A. A. R. statement says.

Rack-Rail Diesel-Electric Locomotive for M. & P. P.

THE first rack-rail Diesel-electric locomotive built by the General Electric Company, Schenectady, N. Y., for the Manitou & Pike's Peak Railway, the highest cog railway in the world, replaces the tilted steam locomotives which for almost fifty years have been pushing sightseers to the summit of this famous mountain.

Contrary to ordinary practice, the 50-passenger car on this unique railway is pushed rather than hauled by the locomotive. The new Diesel-electric locomotive is arranged to provide traction at the wheels as well as the rack-rail, but not simultaneously. It has two axles, weighs 20 tons, and is powered by three Diesel-electric generating units. Each unit is rated 160 hp. at 1,800 ft. above sea level, but at the top of Pike's Peak, at an eleva-

(*Continued on next left-hand page*)

First rack-rail Diesel-electric locomotive built for Manitou & Pikes Peak

cut down on the arch and you boost the fuel bill

No one questions locomotive Arch economy. The Arch has been so thoroughly proved as a fuel saver by railroad after railroad for years past.

In the urge for money saving don't let the desire to save a few dollars in Arch brick expense by skimping on the Arch blind you to the fact that every dollar thus "saved", boosts the fuel bill ten dollars.

The surest way to the lowest operating cost is not in crippling proved economy devices but in making full use of them. This means complete Arches, with every brick in place, for each locomotive that leaves the roundhouse.

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists

AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.
Locomotive Combustion Specialists

tion of 14,109 ft., the engines rate about 100 hp. On the downward trip the locomotive simply backs down the grade in front of the passenger car. Dynamic braking assists in holding the car at a safe speed in descending the steep slopes.

Eddy Reappointed to Railroad Retirement Board

THE Senate on August 1 confirmed President Roosevelt's reappointment of Lee M. Eddy for a Railroad Retirement Board term of five years from August 29. Mr. Eddy, whose nomination went to the Senate on July 28, is railroad labor's representative on the Board.

Enginehouse Stalls Extended at Laurel, Mont.

THE Northern Pacific has awarded a contract amounting to approximately $16,000 to the J. C. Boespflug Construction Company, Miles City, Mont., for the extension of four stalls in its enginehouse at Laurel, Mont., to accommodate its new Z-5 and Z-6 freight locomotives (4-6-6-4 type) and the A-3 passenger locomotives (4-8-4).

President Approves Liability Act Amendments

PRESIDENT Roosevelt has signed S.1708 which amends the law relating to the liability of railroads for injuries to their employees along lines favored by railroad labor. The measure was finally enacted on August 4 with the adoption of a conference report reconciling differing House and Senate versions.

Among other things the amendments provide that in actions brought under the Employers' Liability Act, the so-called "assumption - of - risk - of - employment" defense will not be available to the carrier where an employee's injury or death results in whole or in part from the negligence of the carrier. Another provision makes it a criminal offense to coerce, discipline or discharge an employee in an effort to prevent or punish him for voluntarily furnishing information to a person in interest with reference to the facts incident to the death or injury of any railroad employee; the foregoing with the proviso that nothing in it shall be construed "to void any contract, rule, or regulation with respect to any information contained in the files of the carrier, or other privileged or confidential reports." The amendments also undertake to broaden the scope of the Liability Act so as to include within its provisions employees of common carriers who, while ordinarily engaged in the transportation of interstate commerce, may be, at the time of the injury, temporarily divorced therefrom and engaged in intrastate operations.

New Record in Average Freight Train Speeds

RAILROADS of the United States in the first six months of 1939 established a new high record in the average speed of freight trains, according to J. J. Pelley, president of the Association of American Railroads. This average speed, according to reports for the first half of the year which have just become available, was 64.1 per cent higher than the corresponding period in 1920.

In the first six months of 1939, the average distance traveled per train per day was 405 miles, compared with 400 miles in 1938 and 247 miles in 1920. This represents the average time required for the movement of all freight trains between terminals, including all delays en route.

Supply Trade Notes

THE UNITED STATES RUBBER COMPANY has moved its Detroit, Mich., sales branch from East Jefferson avenue to 5850 Cass avenue.

◆

JOHN G. MUNSON has been elected vice-president, raw materials, of the United States Steel Corporation of Delaware, succeeding Thomas Moses, who retired on August 18.

◆

THE CRANE COMPANY, Chicago, has been appointed national distributors of spring joints manufactured by the Chiksan Tool Company, Fullerton, Cal. The latter company will continue to maintain sales representatives in principal cities.

◆

THE INLAND STEEL COMPANY, Chicago, has issued licenses for the manufacture of Ledloy to the Heppenstall Company, Pittsburgh, Pa., and the American Rolling Mill Company, Middleton, Ohio.

◆

KENNETH J. BURNS, district sales manager of the Youngstown Sheet & Tube Company, Youngstown, Ohio, has been appointed district sales manager of the Inland Steel Company, with headquarters in the company's newly opened district sales office at Cincinnati, Ohio.

◆

ALFRED E. MUNCH, district manager of The United States Metallic Packing Company, Philadelphia, Pa., at St. Paul, Minn., has retired. He will continue his connection with the company in research work. Mr. Munch became associated with the company in 1927.

PHILIP M. GUBA, manager of sales, Chicago district sales office of the Carnegie-Illinois Steel Corporation since January, 1938, has been appointed eastern sales manager, with headquarters at New York and Pittsburgh, Pa. Specifically, Mr.

Philip M. Guba

Guba will co-ordinate sales activities of the company in the eastern area, including offices at Boston, Mass., Hartford, Conn., New York, Philadelphia, Pa., Baltimore, Md., and Washington, D. C. He will be succeeded at Chicago by G. A. Price, present manager of sales, bar, strip, and semi-finished materials division, general sales department, who in turn will be succeeded by T. J. Bray, Jr., manager of sales Pittsburgh district. J. G. Armstrong, Jr., assistant manager of sales, Pittsburgh district, will succeed Mr. Bray.

Mr. Guba has been connected with sales in the steel industry since 1910. From 1918 to 1933, he was sales official of the Donner Steel Company and later of the Republic Steel Corporation. His association with Carnegie-Illinois began in March, 1933, as assistant manager of sales at the Detroit, Mich., office, becoming manager of sales at that office in March, 1935.

◆

LESTER M. CURTISS, assistant general superintendent of the Lukens Steel Company, Coatesville, Pa., has been appointed general superintendent in charge of all operations of the company, succeeding G. Donald Spackman, who has been granted a leave of absence.

◆

RICHARD C. POUCHER has been appointed to take charge of sales engineering problems for the Research Products Corporation, Air Filter division, in Ohio, Michigan, Pennsylvania and New York. Mr. Poucher was formerly with the Diamond Iron Works, Inc.

◆

G. R. PROUT, acting manager of the southwestern district for the General Electric Company's industrial department, has been appointed manager of sales of industrial control, and W. T. Darcy, assistant to W. C. Yates, manager of the control and renewal parts division of General Electric's industrial department, has been appointed manager of sales of renewal parts. Both Mr. Prout and Mr. Darcy are located at Schenectady, N. Y.

◆

RAYMOND WILLEY, president of the Harbison-Walker Refractories Company, has been elected a member of the board of di-

rectors of the American Arch Company to fill the vacancy caused by the death of J. E. Lewis, former president of the Harbison-Walker Refractories Company. George A. Price, executive vice-president of the American Arch Company, has been elected to the executive committee in the place of Mr. Lewis.

◆

H. V. HULEGUARD, sales manager, Diesel locomotive division of the Baldwin Locomotive Works, has been appointed general manager of The Whitcomb Locomotive Company, Rochelle, Ill., a subsidiary of the Baldwin Works, the sales and engineering activities of the Whitcomb company formerly concentrated at Philadelphia having been transferred to Rochelle. Mr. Huleguard was general sales manager of the Whitcomb company previous to his becoming sales manager of the Diesel locomotive division of Baldwin.

Obituary

WILLIAM H. MUSSEY, engineer of research of the Pullman Standard Car Manufacturing Company, Chicago, died in that city on August 22 of a complication of ailments.

◆

BENJAMIN WILSON, since 1918 assistant to the vice-president in charge of operations, of the American Car & Foundry Co., at New York, died in the Post Graduate hospital on August 16, after a brief illness, at the age of 58.

◆

JOSEPH LEIDENGER who retired as vice-president of the Dayton Manufactuuring Company in 1930, and for 20 years was New York representative of the company, died on August 11 at the New York Hospital after a long illness. Mr. Leidenger was 80 years old at the time of his death.

◆

COL. ANSON LEE BOLTE, who with William Waugh, founded the Waugh Equipment Company in 1908, died on July 24 in the Walter Reed Hospital in Washington, D. C., at the age of 79 years. Mr. Bolte served as vice-president of the Waugh Equipment Company until the company was sold to A. J. Pizzini and headquarters moved from Chicago to New York.

◆

WILLIAM C. WHITCOMB, who retired as president of the Whitcomb Locomotive Company, Rochelle, Ill., in 1933, died at Eagle River, Wis., on August 6. Mr. Whitcomb was born in Pittsburgh, Pa., in 1868, and upon completing a college training in engineering, joined his father in the operation of the George D. Whitcomb Company, which later became the Whitcomb Locomotive Company.

◆

CHARLES E. ROBINSON, whose death was noted on page 343 of the August issue, was born 62 years ago. He was a graduate of the Williamson trade school and a teacher of mechanical drawing there for one year before entering the employ of The Baldwin Locomotive Works. During his 40 years with Baldwin Mr. Robinson held many positions in the engineering department. For many years he had charge of the work of getting out sets of tracings furnished to the railroads with locomotive orders. He acted as a checker passing on the correctness of drawings and for some

C. E. Robinson

time was engaged in following up material ordered on the shops. At the time of his death he was manager of the engineering department.

◆

CARL MOSIER, vice-president of the Union Asbestos & Rubber Company, Chicago, died in that city on July 17 following a heart attack. Mr. Mosier was born in Oshkosh, Wis., on April 18, 1888. After completing a business course, he entered the employ of the Harriman Lines in the maintenance and operation department, where he served in a clerical capacity from 1906 to 1911. In the latter year, he became secretary to the chairman of the Board of the Southern Pacific, with headquarters at New York, and in 1912, became secretary to the president of the Illi-

Carl Mosier

nois Central. He was later secretary to the president of the Chicago & Alton. Still later he was appointed assistant purchasing agent of the Chicago & Alton, which position he held until 1915, when he resigned to become associated with L. L. Cohen in the formation of the Union Asbestos & Rubber Company, as secretary-treasurer. In 1929, he was elected vice-president.

JAMES SHIELDS THOMPSON, chairman of the board of the Waugh Equipment Company, New York, died on August 23 at his home in New York. Mr. Thompson was born at Crestline, Ohio, on May 21, 1873. After finishing his education at the Bucyrus, Ohio, high school, he left home to engage in railroading. He began as a maintenance-of-way employee and progressed from one position to another, including that of locomotive engineman, until he became a mechanical engineer. During this time he worked for several railroads and served in the Spanish American War. In 1901 he became associated with the Sargent Company which merged with the American Brake Shoe Company in 1902 to form the American Brake Shoe & Foundry Company. Mr. Thompson, in 1911, was elected a vice-president of the American Brake Shoe & Foundry Company and in 1921 was elected to the board of directors of that company. In 1927 he became vice-chairman of the board and, when he re-

J. S. Thompson

signed from the American Brake Shoe & Foundry Company in 1929, he was also senior vice-president, as well as a member of the executive committee. During his association with the American Brake Shoe & Foundry Company, he was actively engaged in perfecting and developing many important railroad devices as well as a new composition for use in automobile and truck brake linings. During this period Mr. Thompson was also an officer and director of the American Brake Materials Corporation, the American Forge Company, the American Plant and Building Company, the American Malleables Company, the American Manganese Steel Company, the Eastern Steel Castings Company, the Ramapo Ajax Corporation, the Southern Foundry & Machine Company, and the Southern Wheel Company. He gave up his active duties in the American Brake Shoe & Foundry Company in 1929 to found the Firebar Corporation, although he retained his position as vice-chairman of the board of directors of the former company until 1930 when he resigned in order to devote his full time to the Firebar Corporation at Cleveland, Ohio. In 1932 the Firebar Corporation merged with the Waugh Equipment Company, of which Mr. Thompson became chairman of the board of directors.

(*Turn to next left-hand page*)

DIESELIZED YARDS AND TERMINALS HANDLE CARS MORE ECONOMICALLY AND WITH FEWER ASSIGNED LOCOMOTIVES

50 to 75 per cent reduction in locomotive operating costs—high starting tractive effort plus quick acceleration—superior flexibility—high availability—are reasons why EMC "Clear-View" type switchers with unobscured visibility assure faster, smoother and safer car movements at lower cost and with fewer assigned locomotives.

With proved availability averaging 94 per cent, these money-saving EMC Diesels are delivering more work per dollar of invested capital and per dollar of operating expense. Greatest economies are derived from fully EMC Dieselized yards and terminals and where Diesels can be worked 24 hours daily. On one road alone 37 Diesels have replaced 80 steam switchers—and that means huge savings.

ELECTRO-MOTIVE CORPORATION

SUBSIDIARY OF GENERAL MOTORS LA GRANGE, ILLINOIS, U. S. A.

567
567
DES-4
C.R.&I.
EMC
DIESEL OPERATION
Transportation at a Profit
Ruggedness for long life.
Stamina for long continuous running.
Power for heavy movements.
High Availability for intensive utilization.
Superior Visibility for safer, faster operation.
Reliability for low maintenance.
High Efficiency for low fuel consumption.
Accessibility for quick inspections.
Quick Acceleration for faster switching.
GM
GENERAL MOTORS
DIESEL
POWER

Personal Mention

General

EDRED B. HALL, general superintendent of motive power and machinery of the Chicago & North Western, has been appointed chief mechanical officer, with jurisdiction over all locomotive and car matters, with headquarters as before at Chicago.

HARRY P. ALLSTRAND, principal assistant superintendent of motive power and machinery of the Chicago & North Western, has been appointed assistant to the chief executive officer, a newly created position, with headquarters as before at Chicago. Mr. Allstrand was born at Council Bluffs, Iowa, on September 8, 1885, and graduated from Iowa State College in 1913. He entered railway service in 1903 as a machinist apprentice on the North Western at Missouri Valley, Iowa, and in 1907 was promoted to machinist and later to foreman at that point. In 1909, he left railway service to attend college at Ames, Iowa, returning to the North Western after graduation in 1913, as an enginehouse foreman at Clinton, Iowa, later being transferred to South Pekin, Ill., Proviso, Ill., and East Clinton, Iowa. Mr. Allstrand became division foreman at Chaldron, Neb., in 1918, and in 1919, was promoted to assistant master mechanic at that point. He later served as master mechanic at Eagle Grove, Iowa, Belle Plaine and Boone. In 1924, he was appointed efficiency supervisor, with headquarters at Chicago, and in 1926, he became assistant superintendent of motive power and machinery, with the same headquarters. Mr. Allstrand was appointed principal assistant superintendent of motive power and machinery in 1929. He was president of the Western Railway Club in 1929-30.

Harry P. Allstrand

A. G. GEBHARD, master mechanic of the Illinois Central at McComb, Miss., has been appointed trainmaster at Jackson, Miss., with jurisdiction over the Gulf & Ship Island (part of the Illinois Central system), succeeding to a portion of the duties of L. F. Powell, who continues as trainmaster at Jackson, with jurisdiction over the Canton district from Jackson to Canton, Miss., and the Yazoo district.

W. H. MARLIN, district road foreman of engines on the Southern Pacific at Los Angeles, Cal., has been promoted to assistant superintendent on the Salt Lake division, with headquarters at Sparks, Nev.

Master Mechanics and Road Foremen

A. K. LOVE has been appointed master mechanic of the St. Louis & Hannibal, with headquarters at Hannibal, Mo., succeeding A. E. Brand, who has retired after 49 years railroad service.

C. E. BLOOM, general foreman on the Chicago, Burlington & Quincy at Lincoln, Neb., has been promoted to master mechanic at Casper, Wyo., succeeding E. A. Schrank, deceased.

H. D. EDDY, division foreman of the Atchison, Topeka & Santa Fe, at Bakersfield, Cal., has been appointed master mechanic of the Pecos division, with headquarters at Clovis, N. M.

W. D. HITCHCOCK has retired as master mechanic of the Albuquerque division of the Atchison, Topeka & Santa Fe at Winslow, Ariz. Mr. Hitchcock was born in Woolwich, England on July 30, 1869, and came to this country with his parents when three years old. He began his railroad career in 1888, and in February, 1890, entered the employ of the Santa Fe as a machinist at Raton, N. M. He served in this capacity at Needles, Cal., Albuquerque, N. M., and San Marcial, N. M. In November, 1902, he was appointed to enginehouse foreman at Raton, and in 1917, master mechanic at Winslow.

ALBERT D. HALEY, who has been appointed master mechanic of the Illinois Central at McComb, Miss., as noted in the August issue, was born on October 23, 1894, in Claiborne County, Miss. He attended McComb City schools from September 1, 1899, to June 1, 1912, and entered the service of the Illinois Central on August 23, 1912, as a machinist apprentice at McComb. He became a machinist on August 1, 1916, and tool foreman on April 1, 1917. From July 25, 1917, to August 11, 1919, he was a machinist's mate, first class, U. S. Navy. He returned to the Illinois Central as assistant machine foreman at McComb on August 11, 1919. On November 1, 1919, he was appointed tool foreman; on March 1, 1921, assistant erecting foreman; on July 5, 1924, enginehouse foreman, and on September 1, 1927, general foreman. Mr. Haley was transferred to Markham, Ill., as assistant master mechanic on January 16, 1938, and on July 15 of this year (1939) returned to McComb as master mechanic.

A. D. Haley

P. J. DANNEBERG, master mechanic of the Pecos division of the Atchison, Topeka & Santa Fe, with headquarters at Clovis, N. M., has been transferred to Winslow, Ariz., to succeed W. D. Hitchcock.

Car Department

WALTER E. DUNHAM, general superintendent of the car department of the Chicago & North Western at Chicago, has been appointed superintendent of the car department, with the same headquarters.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

DRILLS. — Whitman & Barnes, Detroit, Mich. Catalog No. 96—drills, reamers, screw extractors, counterbores, interchangeable punches, etc.

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SHEET-METAL WORKING MACHINERY.—Ward Machinery Company, 564 W. Washington Boulevard, Chicago. Catalog No. 39. A reference book illustrating and describing machines, tools and supplies of nationally known manufacturers for fabricating sheet metals.

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AMSCO MANGANESE STEEL.—American Manganese Steel Division of the American Brake Shoe & Foundry Company, Chicago Heights, Ill. Sixty-four page illustrated booklet discussing properties of manganese steel and its use in equipment parts exposed to abrasive wear and impact. Amsco production and research facilities also described.

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MACHINE TOOLS. — National Machine Tool Builders' Association. Thirty-two page booklet, "Machine Tools and You,"—a reprint of an address given to the Army Industrial College at Washington, D. C., by Howard W. Dunbar, past president of the association and vice-president and general manager of the Grinding Machinery Division of the Norton Company.